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## PHYCIODES (PHYCIODES): MORE PROGRESS

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**Abstract.** Recent modest findings in *Phyciodes* are reported. *P. tharos tharos* older larvae are not always blacker than *P. cocyta*, although they average darker. *P. tharos tharos* in eastern U.S. sometimes has orange antenna nudum, even as far south as SW Mississippi where orange is slightly more frequent than black. Study of mitochondrial DNA by Wahlberg et al. suggests that *P. tharos* is a distinct species that has received little genetic influx from *P. cocyta*, while *P. cocyta*, *P. batesii*, and *P. pulchella* have enormous overlapping variation in mtDNA due to ancient variability plus some later introgression with each other and with *P. tharos*. *P. (cocyta) diminutor* has been found in northern Ohio, based on a reexamination of *P. "tharos"* specimens used in an electrophoresis study by Porter & Mueller. That study came to the erroneous conclusion that *P. tharos* and *P. cocyta* are conspecific, but actually found that Mich. *P. cocyta* could be conspecific (based on electrophoresis alone) with (misidentified) Ohio *P. (cocyta) diminutor*. Orange-antenna populations previously reported from Penn. and vicinity are probably mostly *P. (cocyta) diminutor*. The species/subspecies status of three *cocyta*-group taxa are discussed: *P. diminutor* could be a species, and *diminutor* and *incognitus* could be conspecific, and all three could be ssp. of *P. cocyta* (a lot of rearing will be needed to determine their status). A neotype of *P. cocyta selenis* is designated. *P. cocyta arenicolor* is a valid local subspecies. A synonym of *P. batesii batesii (maconensis)* is discussed. *P. batesii lakota* rarely has orange antenna club. A conclusive history of the travels and owners of the lectotype/neotype *Phyciodes pulchella* has now been finalized, including the discovery that Foster Hendrickson Benjamin actually wrote the "a/c [according to] Hofer [Carl H'fer]" labels found on numerous Boisduval specimens, in 1925. Other corrections involving Boisduval types are made. The pupal cremaster width of *P. pulchella pulchella* is studied further and averages not as small as previously thought, though it may average smaller. *P. pulchella* near *pulchella* populations from the E slope of the southern Sierra Nevada show past introgression from ssp. *camillus*, as do some intergrading synonyms in Nevada. Other recent synonymies are discussed and presented in a completely annotated synomimic checklist. More larval/pupal descriptions are presented. Improved identification/description tables are given.

### INTRODUCTION

Scott (1986, 1992, 1994, 1998) researched the systematics and biology of *Phyciodes* (*Phyciodes*), described numerous new life histories, named eleven new taxa, and corrected prior nomenclature including the names of three other taxa. This paper continues the study with recent findings. These findings are mostly modest, but progress marches on, usually in small steps. A study of mitochondrial DNA is discussed.

About 23 different species concepts have been used by various people. The biological species concept says that a species is that set of populations which are reproductively isolated from other organisms. It arose from the study of evolution and genetics, and has a solid foundation of theory behind it, so I see no reason to get rid of it. However, as a practical matter, it is often hard to apply, because natural tests of reproductive isolation (sympatry and synchrony without interbreeding suggests reproductive isolation, for instance) are often absent (some misguided people claim that two populations that are sympatric but allochronic are separate species for instance, even though they have no chance to mate, thus this is NOT a test of reproductive isolation). For example, when one species forks into two during evolution, at the forking point it is obviously nearly impossible to call them one or two species. Other people use simplified species concepts that are actually just lazy shortcuts: A) The genitalic species concept is used by many museum taxonomists, because genitalia is all they know and they do not get out into the field to rear their subjects or study their behavior and ecology. B) A hypersplit species concept is used by some taxonomists nowadays who hope to gain professional employment in systematics; they say they do not believe in subspecies, and they end up just raising all the distinctive subspecies to species level and sinking all the weaker subspecies to synonyms. Through this splitter species concept they

are able to name many more species (all the distinctive ssp. now become species) and thus hope to gain more of the prestige that comes from naming species, while they thus avoid the derision that comes from naming subspecies. This splitter species concept is ridiculous, because of the branching mode of evolution: just after the branches split the differences between them are small, and the differences grow the farther we proceed on the branches, and this continuous gradation of small to large differences justifies more and more categories (species, strong subspecies, weaker subspecies, weak subspecies, etc.), not less. Actually quadrinomials (genus, species, subspecies, weaker subspecies) have more scientific justification than that splitter species concept. C) Some gene jockeys nowadays prefer an operational species concept that says a species is merely a single lineage of the gene they are studying; a very practical species concept, but the study of different genes very often gives different results.

Recently I have come to the conclusion that we do need another species concept, both on scientific and practical grounds: the STENCHOSPECIES. A stenchespecies is any species that does not fit nicely into the biological species definition, because of any number of problems, such as the creatures occupy the forking point between one species and two, or parts of a species interbreed fully in one part of the range but are reproductively isolated at another part (*Cercyonis sthenele/meadii*, and *Limenitis lorquini/weidemeyerii*, for example), or the creatures introgress so much that it is difficult to know what is happening and far more research is needed, or the critters are so closely attached to their hostplants that the “host race” seems to be the main evolutionary unit and the whole polytypic “species” seems to be a horrible senseless mess (butterflies eating *Eriogonum*, including *Euphilotes battoides*, *E. enoptes*, *Apodemia mormo*, *Plebejus acmon/lupini*, though the uncertainty in some of these may just mean that more decades of better research is needed), or the creatures are variable and are hard to identify, or simply that the critters have been poorly studied (there are hundreds of examples here) or the random choice of study sites has caused conclusions to change as more sites are studied. The stenchespecies is thus a useful species concept that takes into account both natural messiness when reproductive isolation is incomplete, and it takes into account bad or incomplete research by systematists; in practice, a lot of the problems we have in assigning species or subspecies status may be resolved through more research, but the opposite may happen also. The stenchespecies is useful emotionally also; as I get older, and wonder why I bother doing research on butterflies for no money when public approval is less than zero, and I realize that it’s not my fault that some of these bugs cannot be pigeonholed into distinct species, it’s nice to place the blame where it belongs: it’s the bugs’ fault, they are stenchespecies!

It is clear that *Phyciodes tharos*, *P. cocyta/diminutor/incognitus*, and even *P. batesii* in the Rockies, are stenchespecies. They are variable, they hybridize and introgress and exchange mtDNA, there are few good characters, the characters change geographically, etc. Nobody likes them. They are stenchespecies.

## METHODS

Larval segments are labeled T1-3 on thorax and A1-10 on abdomen. Larval scoli are named by prefixing B- (for branching spine) to the name of the nearest primary seta, thus BD1 is the scolus near seta D1 (primary setae are present on 1<sup>st</sup>-stage larvae but are mostly lost among numerous secondary setae on older larvae, whereas scoli are present on 2<sup>nd</sup>-stage to mature larvae). Upf=upperside of forewing, unf=underside of forewing, uph=upperside of hindwing, unh=underside of hindwing, ups=upperside, uns=underside. All times are given as 24-hour standard time.

## SYNONYMIC LIST OF *PHYCIODES*

The more a subspecies is indented, the less distinctive it is. The nomenclature of this group was so incompetently disgusting, that I list all the gory details of the repairs, to help future authors prevent errors in their checklists.

### A. *mylitta* species-group

1a. *mylitta mylitta* (W. H. Edwards) 1861, *MELITAEA*, Proc. Acad. Nat. Sci. Philadelphia 13:160-161, neotype male CAS designated by F. M. Brown (1966, Trans. Amer. Ent. Soc. 92:438-442), TL “Texas; Kansas; California”, now Stanyan Hill, San Francisco, Calif. (locality of neotype). ==Homonym *collina* (Behr) 1863, *MELITAEA*, Proc. Calif. Acad. Nat. Sci. 3:86, type burned in 1906 fire, neotype male CAS designated by J. Emmel, T. Emmel, & Mattoon (1998, Syst. W N.A. Butts. p. 100-101, figs. 34-36; note that their citation for F. M. Brown 1965 in their Literature Cited should be J. Lepid. Soc. 19:197-211), TL formerly “vicinity of San Francisco, hills of Contra Costa Co.”, now Presidio, San Francisco, Calif. (locality of neotype). According to J. Pelham, *collina* (Behr) 1863 is a junior homonym of *MELITAEA collina* Lederer 1861, Wien. Ent. Monat. 5(5):148, pl. 1, figs. 4, 5. The *collina* (Behr) 1863 is not a homonym of *callina* Bd. (1869), because it is older than *callina*, and the ICZN Code states that “the difference of a single letter [o versus a] is sufficient to prevent homonymy”. Note: Miller & Brown (1981, Catalogue/Checklist Butts. Amer. N of Mex.) wrongly listed *callina* (Bd.) 1869, *MELITAEA*, Ann. Soc. Ent. Belgique 12:54, TL Sonora, as a ssp. of *mylitta*, and dos Passos (1964, Checklist) wrongly listed it as a misspelling of *collina* (Behr). F. M. Brown (1965, J. Lepid. Soc. 19:207-210) proved *callina* to be a ssp. of *Texola elada* from Sonora Mexico and stated that “the Sonoran specimens were the basis of the original description”, therefore the *callina* “lectotype” from Sonora in CM in Brown’s fig. 4 is the holotype (it is the same specimen that Higgins 1960 [Trans. Royal Ent. Soc. Lond. 112:381-475] called the holotype), not the *callina* “lectotype” from Mexico in Brown’s fig. 5. ==Synonym *epula* (Boisduval) 1869, *MELITAEA*, Ann. Soc. Ent. Belgique 12:54.

Higgins 1981 (Bull Brit. Mus. Nat. Hist. [Ent.] 43:88) claimed to have “designated [examined]” a lectotype *epula* in the BMNH, a specimen figured by Oberthür (1914 p. 80 pl. 259, fig. 2176). However Philip Ackery could not find such a designated specimen lectotype in BMNH, so J. Emmel, T. Emmel, & Mattoon (1998, Syst. W N.A. Butts. p.31, figs. 234-236) designated a female lectotype from one of two syntypes in U.S. National Museum collection (the specimen figured by Oberthür on his fig. 2177). TL “l’interieur de la Californie”, restricted to San Francisco, Calif. by J. Emmel, T. Emmel, & Mattoon (1998, Syst. W N.A. Butts., p.31). ==Synonym transition form aberration (infrasubspecific name) *collinsi* Gunder 1930, Bull. S. Calif. Acad. Sci. 29:62-63, holotype male AMNH, TL Collins Ranch, Voltair, Calif. ==Synonym aberration (infrasubspecific name) *macyi* Fender 1930, Ent. News 41:182, type was in Fender collection, TL McMinnville, Ore.

- 1b. *mylitta arizonensis* Bauer 1975, in W. Howe (1975, Butts. N. America, p. 149-150), holotype in David Bauer collection (Ferris, ed., 1989), TL Colo.-Ariz.-New Mex.-Sonora, restricted to “Arizona” by Scott (1994) because of the name.
- 1c. *mylitta mexicana* Hall 1928, Bull. Hill Museum Witley (suppl. to vol. 2), p. 44, holotype male BMNH, TL Jalapa, Veracruz, Mex.
- 1d. *mylitta arida* (Skinner) 1917, MELITAEA, Ent. News 28:328-329, holotype male CM (photo of holotype sent by John Rawlins to Scott [1998], with a red label “type Melitaea arida Skin. 7020” and a white label “Cochise Co. May. Arizona”). Pseudotype male figured on plate LIX fig. 22 of Holland's 1931 Butterfly Book. TL “Cochise Co. Ariz.” obviously mislabeled, corrected to Morelia Mexico or nearby Mexico by Scott (1998) and current paper.
- 1e. *mylitta thebais* Godman & Salvin 1878, Proc. Zool. Soc. London [1878]:268, holotype male BMNH, TL mts. of Oaxaca Mex.
- 2a. *pallida pallida* (W. H. Edwards) 1864, MELITAEA, Proc. Ent. Soc. Philadelphia 2:505, neotype female CM, designated by F. M. Brown (1966, Trans. Amer. Ent. Soc. 92:443-448), TL “Texas, Kansas”, now Flagstaff Mtn., Boulder Co., Colo. (locality of neotype). F. M. Brown (1966, Trans. Amer. Ent. Soc. 92:443-448) discusses and illustrates a female pseudotype, a specimen of *P. pulchella camillus* labeled “Camilus % v. pallida type Texas”, evidently in AMNH. ==Synonym (an available subspecies/species name) *mata* (Reakirt) 1866, ERESIA, Proc. Ent. Soc. Philadelphia 6:142, holotype Field Museum NH, TL “Rocky Mts., Colorado Territory”, restricted by Scott (1994, Papilio [New Series] #10) to Flagstaff Mtn., Boulder Co., Colo.
- 2b. *pallida barnesi* Skinner 1897, Can. Ent. 29:155, holotype male CM, TL Glenwood Springs, Garfield Co., Colo.
- 3a. *orseis orseis* (W. H. Edwards) 1871, Trans. Amer. Ent. Soc. 3:206, lectotype male AMNH designated by F. M. Brown (1966, Trans. Amer. Ent. Soc. 92:449-451), TL Mt. St. Helena, Napa Co. Calif. (locality of lectotype). ==Synonym transition form aberration (infrasubspecific name) *edwardsi* Gunder 1927, Ent. News 38:135, holotype female (stated to be in NMNH=USNM in O.D., but all the rest of Gunder’s types are in AMNH), TL “California”.
- 3b. *orseis herlani* Bauer 1975, in W. Howe, Butts. North America p. 148, type in David Bauer collection according to Miller and Brown (1981, Catalogue/Checklist Butts. America N of Mex.), holotype male and allotype male figured by Howe (1975, Butts. North America pl. 45 figs. 9-10), TL Glenbrook Creek, Douglas Co. Nev.

#### B. *tharos* species-group

- 4a. *tharos riocolorado* Scott 1992, Papilio (New Series)#6 p. 44, holotype male LACM, TL Moab, Grand Co. Utah.
- 4b. *tharos tharos* (Drury) 1773, PAPILIO, Illus. Nat. Hist., I:43-44 & pl. 21 figs. 5-6 (1770) and addendum to vol. II:index to vol. I (1773)(first mention of name *tharos* appeared in index in 1773), type sold and lost. The type could have ended up in the Macleay Museum collection at Univ. of Sydney, Sydney, Australia, because Macleay bought many specimens from Drury, but John Calhoun tells me that the type more likely would have gone into the collection of George Milne, who obtained most of Drury’s types, then most of Milne’s coll. was purchased in 1839 by the BMNH, where the type could have been overlooked in the main collection or among old unsorted Lepidoptera where Gerardo Lamas has found misplaced types. The Macleay collection does contain some *Phyciodes*, including 1%2& *P. tharos*, 1% *P. cocyta*, and 1%3& *P. pulchella*. The labels on the *tharos* have the number 3972, on the *pulchella* the number 2263, and these numbers are evidently accession numbers in the Macleay Museum, as John Calhoun tells me that those numbers do not correspond to Francillon’s catalogue or to North American Lepidoptera catalogs. Neotype male AMNH designated by Scott (1994, Papilio [New Series] #7, p. 27-29, fig. 90), TL “New York”, now Van Cortlandt Park, New York City, NY (locality of neotype). ==Synonym *euclea* (Bergstraesser) 1780, PAPILIO, Nomencl. Beschr. Gräfschaf Hanau-Münzenberg 4:23, type lost, neotype male AMNH designated by Scott (1994, Papilio [New Series] #7 p. 27-29, fig. 97), TL “England”, now New York City and vicinity, NY (locality of neotype). ==Synonym *tharossa* (misspelling) Godart 1819, ARGYNNIS, Enc. Meth. 9:289. ==Synonym *pharos* (misspelling) Harris 1862, Rept. Ins. Inj. Veg. (Flint’s ed.) p. 289. ==Synonym *packardii* (Saunders) 1869, MELITAEA, in Packard, Guide Stud. Ins.:256, types lost or in CNC?, TL Grimsby, Ontario just W of Niagara Falls according to W. Edwards (1874-1884), which is

barely in the range of *P. tharos* and in the range of *P. cocyta*; the type (figured by W. Edwards) is an extreme cold-temperature aberration that cannot be assigned properly to either *P. tharos* or *P. cocyta*, so Scott (1994) arbitrarily assigned it to *P. tharos*. ==Synonym aberration (infrasubspecific name) *reaghi* Reiff 1913, Ent. News 24:305, holotype female USNM, TL Franklin, Mass.; *reaghi* may belong to *P. cocyta* rather than *P. tharos*, I have not seen the type. ==Synonym *distincta* Bauer 1975, in W. Howe, Butts. North America, p. 144, type in LACM (=Natural History Museum Los Angeles County) according to Ferris (ed., 1989), TL Calexico, Imperial Co. Calif.

4c. *tharos orantain* Scott 1998, Papilio (New Series) #10 p. 8-10, figs. 3 (holotype male)-4 (allotype female), holotype male BMNH, TL Barr Lake, Adams County, Colorado.

5a. *cocyta cocyta* (Cramer) 1777, PAPILIO, Uitlandische Kapellen... 2:7, pl. 101 figs. A,B,C, type lost, neotype male AMNH designated by Scott (1994, Papilio [New Series] #7, p. 35-36, fig.111), TL unstated for the male in O.D. figs. A & B that Scott used to fix the name (the very different-looking female fig C was from Surinam, which was either mislabeled if the female is a badly-painted spring form of *P. cocyta*, or fig. C could represent another species actually found in Surinam), TL now Black Rock, Cape Breton, Nova Scotia (locality of neotype).

++Homonym *morpheus* (Fabricius) 1775, PAPILIO, Syst. Ent. p. 530; a junior primary homonym from 1775-1806 of *Papilio* (now *Heteropterus* Dumenil 1806) *morpheus* Pallas 1771 (Hesperiidae); type lost, TL America boreali, restricted to Nova Scotia by Scott (1986, Butts. North America). ==Synonym *arctica* dos Passos 1935, Can. Ent. 67:87, holotype male AMNH, TL Table Mtn., Port au Port, Newfoundland.

5b. *cocyta selenis* (W. Kirby) 1837, MELITAEA, Fauna Bor.-Americana 4:289, type evidently lost, *selenis* neotype male designated by Scott 2005 (this paper) from Grosky Rd., The Pas, Manitoba, June 15, 2002, collected by Walter Vladamir Krivda, (neotype fig.plate V of Scott et al. 2006, Papilio #12)(BMNH), TL "North America", restricted by Scott (1994 Papilio [New Series] # 7 p. 35) to Cumberland House, 54° N Lat., Saskatchewan, now corrected to locality of neotype Grosky Rd., The Pas, Man. ==Synonym *marcia* (W. H. Edwards) 1868 (preprint issued 1868; the 1869 date in Higgins 1981, Bull Brit. Mus. Nat. Hist. [Ent.] 43:86, is wrong), MELITAEA, Trans. Amer. Ent. Soc. 2:207-209, TL "New York to Louisiana". Invalid lectotype=pseudotype CM, labeled "marcia male / A. Hunter / type" (photo proves lectotype is female, not male), from Hunter, Greene County, New York was designated by F. M. Brown (1966, Trans. Amer. Ent. Soc. 92: 432-433). This Brown lectotype was declared invalid by Scott (1998) and by Gatrell (2004), because it was collected after the original description so cannot be a valid syntype; additionally, it cannot be identified to species (it could actually be *P. tharos*), does not fit the original description, is the opposite (and unidentifiable) sex, and was collected at the fringe of the range stated by W. Edwards. A valid lectotype male *marcia* in Carnegie Museum was designated by Gatrell (2004, fig. 43) from Kanawha River (the town of Coalburgh, which was renamed Cabin Creek in 1894), Kanawha Co. W.Va., coll. William Henry Edwards. TL of *marcia* "New York to Louisiana", now Coalburgh, Kanawha Valley, West Virginia (designated by Scott [1998], and locality of Gatrell's [2004] lectotype). The name *marcia* (W. Edwards) 1868 can still be used as an infrasubspecific name for the melanic-unh spring form of various other *Phyciodes* species, even though the new *marcia* lectotype designated by Gatrell (2004) belongs to *P. cocyta*, because W. Edwards later changed his concept of *marcia* and applied the name *marcia* to the dark-unh seasonal form of several species of *Phyciodes* which he thought were *tharos* but were a mixture of *P. tharos* and *P. cocyta*, and infrasubspecific names are not regulated by the ICZN code. ==Synonym *pascoensis* Wright 1905, Butts. West Coast, p. 165, lectotype male CAS designated by J. W. Tilden (1975, Occas. Pap. Calif. Acad. Sci. [118]:23), TL Pasco, Franklin County Washington. Most local collectors seem to think *pascoensis* is a valid ssp., but I will need a real series of it, plus immatures, to consider it a ssp. ==Synonym vernal form (infrasubspecific name) *herse* G. C. Hall 1924 J. N.Y. Ent. Soc. 32:110, holotype female AMNH, TL Taft, British Columbia. ==Synonym form aberration (infrasubspecific name) *nigrescens* G. C. Hall 1924 J. N.Y. Ent. Soc. 32:110, holotype female AMNH, TL Taft, British Columbia. ==Synonym transition form aberration (infrasubspecific name) *dyari* Gunder 1928, Can. Ent. 60:167, holotype male USNM, TL Webster, New Hampshire. ==Synonym transition form aberration (infrasubspecific name) *mcdunnoughi* Gunder 1928, Can. Ent. 60:167, holotype female (not male as Higgins stated) CNC, TL Olds, Alberta (label says "N.W.T."=Northwest Territories, but Alberta was not separated from NWT until 1905, and the collector Thomas N. Willing collected in Alberta from Lethbridge to Edmonton from 1894-1904)(this aberration has most of the outer part of the fw tawny, making it difficult to identify to species; Gunder named it in *Phyciodes campestris*, and the unf of the type lacks black spots, and the uph has a black line across it on left uph and a band across it on right uph, suggesting it is *P. pulchella* [*campestris*] *owimba*, but the tawny upf evidently affected uns also and erased the black unf spots; the fw costa is curved like *P. cocyta*, and *P. pulchella* *owimba* occurs only in the mts. and does not occur near Olds today which is plains aspen ecotone habitat occupied by *P. cocyta*, and N. Kondla tells me that Willing probably did not get into the mts. to collect; so based on the locality I hereby assign *mcdunnoughi* to *P. cocyta* and not to *P. pulchella*).

5c. *cocyta arenicolor* Austin 1998 (Austin 1998a), in T. Emmel ed., Syst. W N.A. Butts. p. 577-578, figs. 17-20, holotype male Nevada State Museum, TL Warm Springs, 1798 m, Steptoe Valley, White Pine Co. Nevada.

- 6a. *diminutor* (or *cocyta*?) *diminutor* Scott 1998, Papilio (New Series) #10 p. 13-15, figs. 5 (holotype male)-6 (allotype female), holotype male BMNH, TL NE Conger, Freeborn Co., Minnesota.
- 6b. *diminutor* (or *cocyta*?) *incognitus* Gatrell 2004, The Taxonomic Report of The International Lepidoptera Survey 4(8):1-19, holotype male in R. Gatrell collection now in Florida State Coll. Arthropods in McGuire Center Gainesville Fla., TL Duncan Ridge Rd., 3700', Union Co. Georgia.
- 7a. *batesii batesii* (Reakirt) 1865, ERESIA, Proc. Ent. Soc. Philadelphia 5:226-227, syntypes(s) Field Museum NH, TL "Winchester, [Frederick Co.] Va.; Gloucester, [Gloucester Co.] N.J.", restricted to Winchester Va. by Scott (1994), correcting Klots (1951) who merely stated "TL Gloucester, New Jersey" (Gloucester specimens evidently now lost and may have been *P. cocyta*). ==Synonym transition form aberration (infrasubspecific name) *harperi* Gunder 1932, Can. Ent. 64:283-284, holotype female AMNH, TL McCreary, Manitoba. ==Synonym *maconensis* R. Gatrell 1998, The Taxonomic Report of The International Lepidoptera Survey 1(3):1-8, holotype male Jones Knob, Macon Co. N.C., in Florida State Coll. Of Arthropods.
- 7b. *batesii lakota* Scott 1994, Papilio (New Series) #7 p. 50-56, figs. 137-148 (holotype male 138, allotype female 139), holotype male BMNH, TL Pine Ridge, Sioux Co., Nebraska.
- 7c. *batesii saskatchewan* Scott 2006 (present paper). TL Halfway Lake (N of Edmonton near Clyde) Alberta, holotype fig. Scott et al. (2006, Papilio #12), & types fig. Scott (1994, holotype male BMNH fig. 175, paratypes figs. 173-4, 176-7).
- 7d. *batesii apsaalooke* Scott 1994, Papilio (New Series) #7 p. 56-61, figs. 149-160 (holotype male 150, allotype female 151), holotype male BMNH, TL Hidden Basin Cgd., Bighorn Co. Wyo.
- 7e. *batesiianasazi* Scott 1994, Papilio (New Series) #7 p. 61-65, figs. 161-172 (holotype male 162, allotype female 163), holotype male BMNH, TL near Gateway, Mesa Co. Colo.
- 8a. *pulchella pulchella* (Boisduval) 1852, MELITAEA, Ann. Soc. Entomol. France (2)10(2):306, no. 4, lectotype male USNM designated by J. Emmel, T. Emmel, & Mattoon (1998, Syst. W N.A. Butts. p. 18, figs. 102-104), this lectotype male specimen also designated neotype by Scott (1994) (in case lectotype was really a pseudotype that had been labeled "type" after Boisduval's publication), TL "Californie", restricted to San Francisco Calif. by Scott (1994) and J. Emmel, T. Emmel, & Mattoon (1998, Syst. W N.A. Butts. p. 18). ==Synonym *pratensis* (Behr) 1863, MELITAEA, Proc. Calif. Acad. Nat. Sci. 3:86-87, type destroyed in 1906 fire at CAS, neotype male CAS, designated by J. Emmel, T. Emmel, & Mattoon (1998, Syst. W N.A. Butts. p. 99, figs. 25-27), TL was vic. San Francisco, now locality of neotype, Old Cemetery, San Francisco, Calif. ==Synonym *campestris* (Behr) 1863, MELITAEA, Proc. Calif. Acad. Nat. Sci. 3:86, type destroyed in 1906 fire at CAS, neotype female CAS designated by J. Emmel, T. Emmel, & Mattoon (1998, Syst. W N.A. Butts. p. 99-100, figs. 28-30), TL was evidently vic. San Francisco by implication, now locality of neotype, Old Cemetery, San Francisco, Calif.; designated a synonym of *pratensis* by first reviser W. Edwards (1873, Synopsis of North Amer. Butterflies). ==Synonym *inornatus* Austin 1998, in T. Emmel ed., Systematics W N.A. Butts. p. 739-740, figs. 1-2 (Austin 1998b), holotype male in Allyn Museum of Entomology, TL Clear Creek, 1500m, 2.9 mi. E Grass Valley Rd., Sonoma Range, Pershing Co. Nevada.
- 8b. *pulchella deltarufa* Scott 1998, Papilio (New Series) #10 p. 25-26, figs. 34 (holotype male)-35 (allotype female), holotype male BMNH, TL Davis, Yolo Co. Calif.
- 8c. *pulchella montana* (Behr) 1863, MELITAEA, Proc. Calif. Acad. Sci. 3:85-86, type destroyed in 1906 fire at CAS, neotype male CAS designated by J. Emmel, T. Emmel, & Mattoon (1998, Syst. W N.A. Butts. p. 100, figs. 31-33), TL was "vic. Los Angeles, headwaters of Tuolumne River, Yosemite Valley", now is locality of neotype, Tuolumne Meadows, Tuolumne Co., Calif. ==Synonym *orsa* (Boisduval) 1869, MELITAEA, Ann. Soc. Ent. Belgique 12:55, TL interieur de la Californie. Higgins 1981 (Bull Brit. Mus. Nat. Hist. [Ent.] 43:88) claimed to have "designated [examined]" a male syntype in BMNH as lectotype, but Philip Ackery could not find a designated specimen there, so a lectotype male in USNM (not BMNH) was designated by J. Emmel, T. Emmel, & Mattoon (1998, Syst. W N.A. Butts., p. 31-32, figs. 237-239), who restricted TL to Gold Lake, Sierra Co. Calif. ==Synonym *vallis* Austin 1998, in T. Emmel ed., Systematics W N.A. Butts. P. 740-742, figs. 1-2 (Austin 1998b), holotype male in Allyn Museum of Entomology, TL Nevada road 338 at Garden Canyon, 1820m, Sweetwater Mts., Lyon Co., Nevada.
- 8d. *pulchella tutchone* Scott 1994, Papilio (New Series) #7, p. 75, figs. 189-192 (holotype male 189), holotype male BMNH, TL Nickel Creek, 4000', in SW Yukon.
- 8e. *pulchella owimba* Scott 1998, Papilio (New Series) #10 p. 26-27, figs. 36-37 (holotype male 36), holotype male BMNH, TL Pattee Canyon, Missoula County, Montana.
- 8f. *pulchella camillus* W. H. Edwards 1871, Trans. Amer. Ent. Soc. 3:268-269, lectotype male CM designated by F. M. Brown (1966, Trans. Amer. Ent. Soc. 92:451-453), TL Colorado, restricted by F. M. Brown (1966, Trans. Amer. Ent. Soc. 92:451) to Fairplay, Park Co. Colo. ==Synonym *emissa* W. H. Edwards 1871, Trans. Amer. Ent. Soc. 3:269-270, (based on spring form), designated a synonym of *camillus* by first reviser W. Edwards 1884 Trans. Amer. Ent. Soc. 12:245-337, lectotype female CM designated by F. M. Brown (1966, Trans. Amer. Ent. Soc.

92:455), TL Colorado, restricted by F. M. Brown (1966, Trans. Amer. Ent. Soc. 92:453) to Denver, Denver Co., Colo. ==Synonym aberration (infrasubspecific name) *rohweri* T. Cockerell 1913, Entomologist 46:308, holotype USNM, TL Boulder, Boulder Co. Colo. ==Synonym aberration (infrasubspecific name) *tristis* T. Cockerell 1913, Entomologist 46:308, holotype USNM, TL Jim Creek, Boulder Co. Colo.

- 8g. *pulchella sacramento* Scott 2006 (present paper), holotype male BMNH fig. Scott et al. (2006, Papilio (New Series) #12)
- 8h. *pulchella shoshoni* Scott 1994, Papilio (New Series) #7 p. 76, figs. 193-196 (holotype male 194, allotype female 196), holotype male BMNH, TL Battle Mtn., Elko Co. Nev.

#### C. *phaon* species-group

9. *pallescens* (Felder) 1869, ERESIA, Verh. zool.-bot. Ges. Wien 19: 469, syntypes BMNH and NM Vienna, TL Mex.: Puebla, Morelos (region of Cuernavaca).
- 10a. *picta picta* (W. H. Edwards) 1865, MELITAEA, Proc. Ent. Soc. Philadelphia 4:201, lectotype male Field Museum NH (Chicago) designated by F. M. Brown (1966, Trans. Amer. Ent. Soc. 92:455-457), TL Nebraska territory, restricted by F. M. Brown (1966, Trans. Amer. Ent. Soc. 92:455) to North Platte, Lincoln Co. Neb. ==Synonym aberration (infrasubspecific name) *jemezensis* Brehme 1913, Ent. News. 24:194, holotype male location unknown?AMNH, TL Jemez Springs, Sandoval Co. New Mex.
- 10b. *picta canace* W. H. Edwards 1871, Trans. Amer. Ent. Soc. 3:206-207, neotype male CM designated by F. M. Brown (1966, Trans. Amer. Ent. Soc. 92:457-461), TL "southern California", corrected to Arizona by W. H. Edwards (1882, Papilio 2:21-22), restricted by F. M. Brown (1966, Trans. Amer. Ent. Soc. 92:459) to vic. Tucson, Pima Co., Ariz.
- 11a. *phaon phaon* (W. H. Edwards) 1864, MELITAEA, Proc. Ent. Soc. Philadelphia 2:505-506, neotype male CM designated by F. M. Brown (1966, Trans. Amer. Ent. Soc. 92:434-438), TL St. Simons Island, Glynn County, Georgia (locality of neotype). F. M. Brown (1966, Trans. Amer. Ent. Soc. 92:436) notes that the original description of *Chlosyne gorgone* (*Dryas reticulata* [*reticulata* being the subgenus] *Gorgone* Hübner 1810, Sammlung exotischer Schmett. Vol. 1, pl. [41], figs. 1-4; a color copy of Hübner's plate 41 is in F. M. Brown [1974] Bull. Allyn Mus. #16 p. 6) illustrated two specimens which are now considered to be two different species! The male (figs. 1-2) is now considered to be *C. gorgone* but the female (figs. 3-4) is now considered to be *P. phaon*. F. M. Brown (1974, Bull. Allyn Mus. #16 p. 1-12) details the hundred years of confusion regarding these names and *ismeria*, as some people used *ismeria* for *gorgone* and/or used *gorgone* for *phaon*, and Brown indicates that today's usage follows Barnes and McDunnough (1917, Checklist of Lep. Boreal Amer.), who used *gorgone* as a valid species name based on figs. 1-2, and used *phaon* as a valid name with the female *gorgone* on figs. 3-4 as a synonym. But as late as 1964 C. dos Passos (Synonymic list of Nearctic Rhop.) used *ismeria* for *gorgone* and *gorgone* for *phaon*, but dos Passos then changed his mind in 1969 (J. Lepid. Soc. 23:115-125), promising to explain his decision in a later paper which evidently never was published. Then F. M. Brown (1974, Bull. Allyn Mus. #16 p. 5) hypothesized that Hübner could be considered to be a first revisor in 1821 when he published a very rare 8 page pamphlet, which on un-numbered page 3 of its index has an entry "Gorgone Pap. nym. F. Dryas reticulata: Phyciodes cocyta", but Brown states that this "first revisor" action does not invalidate the use of the name *gorgone* in association with either *carlota* (now included in *C. gorgone*) or *phaon* (actually, Scott's opinion is that perhaps Hübner [1821] thought *gorgone* was like *P. cocyta*, and therefore thought that the name *gorgone* belonged to figs. 3-4 because figs. 3-4 are paintings of *Phyciodes*, meaning *gorgone* is the proper name for *P. phaon*). Brown did not conclusively resolve this issue (his last paragraph is a disappointing vacillating disclaimer abandoning all responsibility). But finally R. Gatrell (1998, Taxonomic Report of The International Lepidoptera Survey, 1[2]:1-9) designated a neotype male *gorgone* from River Rd., Burke Co. Ga. in Allyn Mus. of Entomology, which finally settles the controversy, as this neotype is the *Chlosyne* species, not the *Phyciodes*. Note that J. Calhoun, in three papers in 2003 (J. Lepid. Soc. 57:204-219) and 2004 (J. Lepid. Soc. 58:143-168) and 2005 (J. Lepid. Soc. 59:172-3), proved that the name *ismeria* does properly refer to *gorgone*, because the original painting of *ismeria* was poorly copied from a painting of *gorgone* that has its zigzag unh median band, faint traces on the original *ismeria* painting match the *gorgone* painting, and other paintings of *gorgone* were bad and resembled the *ismeria* painting (a series of paintings grades from *gorgone* to *ismeria*, as the artistry grew more surrealistic), and a female *gorgone* in BMNH was identified by Doubleday as a specimen of *ismeria* from John Abbot, and the larva and pupa illustrations of *ismeria* fit *C. gorgone*. The description, and adult larva pupa paintings of *ismeria* are nothing like *C. nycteis*. ==Synonym spring form (infrasubspecific name) *hiemalis* W. H. Edwards 1878, Butts. N. Amer. 2:[179, pl. 32], figs. 14-15 (not 16-17 as stated in text), no type, TL St. Simons Is., Glynn Co. Ga. ==Synonym summer form (infrasubspecific name) *aestiva* 1878, Butts. N. Amer. 2:[179-180, pl. 32], figs. 16-17 (not 14-15 as stated in text), no type, TL St. Simons Is., Glynn Co. Ga. ==Synonym aberration (infrasubspecific name) *nox* Gunder 1928, Can. Ent. 60:167, holotype USNM, TL Brownsville, Tex. ==Synonym

- aberration (infrasubspecific name) *thornei* Gunder 1934, Can. Ent. 66:130-131, holotype AMNH, TL Chula Vista, San Diego Co., Calif.
- 11b. *phaon jalapeno* Scott 1998, Papilio (New Series) #10, p. 30, figs. 40 (holotype male)-41 (allotype female), holotype male BMNH, TL Mesa, Maricopa County, Arizona.
- 11c *phaon* ssp. or syn. *maya* Hall 1928, Bull. Hill Mus. Witley (suppl. to vol. 2) p. 41, holotype male Booth Museum (Brighton, England), TL Lake Amatitlan, 1260 m, Guatemala. The holotype is very dark according to Gerardo Lamas Müller, so *maya* could be a ssp., or the holotype could be merely aberrant.

#### *Phyciodes* (*Eresia*, or near *Eresia*)

12. *graphica* (R. Felder) April 1869, ERESIA, Verh. zool.-bot. Ges. Wien 19:470, male female syntypes in ?NM Vienna, TL Huahuapan, Mex. ==Synonym *vesta* (W. H. Edwards) Sept.-Oct. 1869, MELITAEA, Trans. Amer. Ent. Soc. 2:371-372, neotype male CM designated by F. M. Brown (1966, Trans. Amer. Ent. Soc. 92:461-464), TL Texas, restricted by F. M. Brown (1966, Trans. Amer. Ent. Soc. 92:461-464) to New (not Neu) Braunfels, Comal Co., Texas. ==Synonym *boucardi* Godman & Salvin 1878, Proc. Zool. Soc. London, [1878]:268, holotype male BMNH, TL Putla, Mexico. Synonym spring form (infrasubspecific name) *hiemalis* W. H. Edwards 1878, Butts. N. Amer. 2:[181, pl. 32] figs. 18-19 (not 20-21 as stated in text), the same name *hiemalis* was used for *Phyciodes phaon* (but is not a homonym because homonymy does not apply to infrasubspecific names), no type, TL "Texas". Synonym summer form (infrasubspecific name) *aestiva* W. H. Edwards 1878, Butts. N. Amer. 2:[182, pl. 32] figs. 20-21 (not 18-19 as stated in text), the same name *aestiva* was used for *Phyciodes phaon* (but is not a homonym because homonymy does not apply to infrasubspecific names), no type, TL "Texas". ==Synonym *vestalis* Hall 1929, Bull. Hill Mus., Witley (suppl. to vol. 3) p. 52, holotype male BM-Brighton, TL Guatemala.

TOXOTAXA COMMENTARY: 13 species/subspecies names in subgenus *Phyciodes* have had to have neotypes designated for them, 9 have had to have lectotypes designated, and 13 others have had to have type localities restricted. These data can be looked at two ways: as a horrendous record of incompetence by the original authors, surely one of the worst in all butterflies, or, as remarkable progress. I am certain that current authors have spent far more time correcting the names proposed by past authors, than those original authors spent naming them. F. Martin Brown received an NSF grant of perhaps \$25,000 merely to study and correct the types of William Henry Edwards, and he spent years on the task, producing a pile of expensive papers 2 inches thick. In other fields of science, old bad work is happily ignored, but in taxonomy old bad work hangs around forever, because the backward rules in the ICZN Code of Nomenclature force taxonomists to dive into the old-name sewer and swim around in the murky sludge to find horrid things and then sanitize them. Half the Code involves minute grammatical rules of a dead language, latin. Instead of stability, the Code allows instability by permitting the replacement of current names by old dead ones, and by constantly changing the endings of species and subspecies names in order to match—in male homosexual or lesbian fashion—the presumed sex of the name with the sex of the genus with which it happens to be combined this week (a reviewer suggests that my view here is homophobic, but I assure the readers it is not, I just use those caustic words to show that the whole process of changing the suffixes is incredibly silly; lepidopterists including me are surely quite tolerant in this regard, since they were all taunted as a young lepidopterist by other kids; I think it is just plain silly to have male-male and female-female combinations, but not male-female, as every butterfly taxon actually consists of males and females so is really not assignable to sex, and all nouns are not classified into male or female in many languages such as english as they are in latin and spanish). Thus there are herds of would-be latin grammarians who roam the checklists and try to deduce the sex of scientific names, and change the endings to match the sex of genus and species, and they often do this even if the original author did not intend his names to be latin (his intention was to use a name in another language that uses the latin alphabet). Many young biologists are rebelling against the anachronistic ICZN, which wastes time and money on the legalistic interpretation of old work rather than on productive biological studies of ecology/behavior etc. Is it any wonder that taxonomists are scorned by other biologists, and are becoming extinct as new jobs are being filled with gene jockeys? Perhaps we will see some welcome changes in the Code in a few decades when the current crop of old anachronistic pedantic taxonomists die off and are not replaced. It's time to bring the ICZN into the modern age, and winch our taxonomists out of the old-name sewer, and redirect them toward useful biological work!

#### SPRING AND SUMMER FORM NAMES

The spring (short photoperiod) form of *Phyciodes* species has more brown markings on unh. It has been called form *marcia*, and could still be called that, but *marcia* also applies to a ssp. of *P. cocyta*, and is currently thought to be probably synonymous with *P. cocyta selenis*. This dual role for *marcia* causes confusion, although if the ssp. *marcia* stays a synonym it will not matter. The name *hiemalis* has been applied to the spring form of several species, and the name *aestiva* to the summer form, which names also could be used. The simplest and best solution would seem to use just the words "spring form", or use the generic word "vernalis", though *marcia* could still be used. Infrasubspecific names such as these are not regulated by the ICZN, so people can use whatever names they wish.

## FOREWING SHAPE

Forewing shape seems to differ on the average among *Phyciodes*, which may provide more useful characters. The fw costa seems to be a little more rounded in *P. vesta*, *P. tharos*/*P. cocyta*/*P. batesii*, and *P. phaon*, whereas the fw costa seems to average a little straighter in the others, the *P. mylitta* group, *P. pulchella*, *P. pallescens*, and *P. picta*. The *P. mylitta* group also has the fw margin shaped differently (extended outward about vein M<sub>2</sub>, inward about vein CuA<sub>1</sub>), and has more scalloped wing margins on forewing and hindwing.

## MITOCHONDRIAL DNA

Wahlberg, Oliveira, and Scott (2003) studied the sequence of a long stretch of 1450 base pairs of the cytochrome oxidase subunit I gene of mitochondrial DNA of 140 individuals of *Phyciodes*. The sequence length was twice as long as that studied by most authors, and the number of individuals was vastly more than the number usually studied (some studies analyze only one individual per species). The main conclusion was that there is enormous variation in this DNA, in fact there were 98 different sequences among the 140 individuals. And in three species *P. cocyta*, *P. batesii*, and *P. pulchella*, the DNA overlapped on the phenogram to a huge extent, evidently because these butterflies never underwent bottlenecks during their evolution and their ancestors had variable DNA which was passed down to the current butterflies, even while the butterflies underwent speciation, and because there is still occasional recent introgressive hybridization going on (occasional hybridization occurred and resulted in genes traded between species). Thus in the *tharos*-group, *batesii* has evidently received genes from *pulchella* and *tharos*, *cocyta* has received genes from *tharos*, *pulchella* has received genes from *cocyta/batesii* and evidently from *tharos*, and *batesii* and *cocyta* have swapped a lot of genes in one or probably both directions. Only *tharos* seems to have not received many genes from the other three, as the 18 individuals all clustered together on the phenogram, unlike *cocyta-batesii-pulchella* whose individuals were all over the phenogram, and this surprising result suggests that *tharos* is really a distinct species, not just an interbreeding part of *cocyta*. Lepidopterists had always thought that *tharos* and *cocyta* were minimally distinct and hybridized often, and in fact Scott (1986) released female *cocyta selenis* in front of male *tharos orantain* in nature and got hundreds of offspring, suggesting that these two are NOT reproductively isolated, so it is still a mystery how *tharos* has managed to protect its genome from influx of *cocyta* DNA (perhaps *tharos* was a uniform population in S-C U.S. and Mexico until people turned E and C U.S. into a weed-infested development, in which the multivoltine weedy *tharos* could explode massively and extend its range but still retain comparatively unvariable mtDNA). New results from Niklas Wahlberg indicate that the *P. cocyta/diminutor* representative in the southern Appalachians (*incognitus*) has evidently gotten its mtDNA from *P. tharos*, as its mtDNA is identical to local *tharos*. *P. batesii* had been thought to be strongly reproductively isolated from other *Phyciodes*, except in Colorado, but the DNA suggests that it has interbred with the others occasionally over the eons; perhaps its population structure, consisting more often of local colonies around lush aster sites, makes it a bit more prone to interbreeding with other species during population lows.

DNA of the *P. mylitta* group produced unsurprising results. But DNA of *P. phaon* seems to be somewhat different from the DNA of *P. picta*/*P. pallescens*. Unfortunately few individuals were analyzed (3 *phaon/jalapeno*, 3 *picta/canace*, 2 *pallescens*), and the lesson of this paper is that DNA can be quite variable. So despite this difference, I will still place all three into the *phaon*-group, because many characters of genitalia and hostplant seem to unite them into one group, the position of *phaon* jumps around in recent unpublished trees (Wahlberg, pers. comm.), and I will guess that past introgression has made the mtDNA of *phaon* and *picta/pallescens* a little different.

DNA is now being touted as the hot new cure for butterfly taxonomy. But actually, it can be quite variable, so studies of just one individual per species can produce totally wrong results. And mtDNA seems to be heavily influenced by even occasional ancient or recent hybridization. Even in the human species mtDNA has proven to be misleading, because it encouraged people to believe that everyone on earth was descended from some African woman named Eve, and to believe that people elsewhere left zero genes, when the truth seems to be that the mtDNA spread independently of the body genes and thus for example orientals today still have shovel-shaped incisors inherited from *Homo erectus* a million years ago (the famous geneticist Francisco J. Ayala debunked the Eve hypothesis several years ago in Science magazine). Since mitochondria are involved in cell metabolism, and are inherited maternally in the egg cytoplasm, it seems that they can rapidly spread throughout a population or even species rather independently of nuclear genes, making mtDNA often useless or misleading for taxonomic studies. As another example, Niklas Wahlberg (in press) has recently found that mtDNA evolved quite differently from nuclear genes within the Nymphalidae. Therefore, DNA studies (and electrophoresis studies, the previous hot fad) are certainly no panacea. Lepidopterists must return to the field and collect basic biological information, find hostplants, rear larvae and pupae, study morphology, and work hard to study relevant genes, all those genes that actually influence these creatures to make them different from related species (nearly all studies of mtDNA and electrophoresis involve genes that seem to be irrelevant to or are merely coincidentally correlated to the important differences between species that taxonomists and ecologists notice).

## INDIVIDUAL SPECIES ACCOUNTS

## A. *PHYCIODES MYLITTA* SPECIES-GROUP

**DEFINITION.** As noted above, the forewing margin differs in this group, as it is extended outward at approximately vein M<sub>2</sub>, inward approx. at vein CuA<sub>1</sub>. Also, the wing margins are more scalloped on forewing and hindwing.

### 1A. *PHYCIODES MYLITTA MYLITTA* (W. H. EEWARDS) 1861

**MISIDENTIFIED PHOTOS.** The top photo on p. 303 in Pyle (2002) is female, not male. And the left middle photo of *P. "orseis"* on p. 297 is actually a *mylitta* male.

**HOSTPLANTS.** Pyle (2002) lists *Cirsium callilepis*, *C. edule*, and *C. hookerianum* as hosts, at least the last from Jonathan Pelham, probably in Wash. Pyle also lists *Centaurea diffusa* and *C. solstitialis* as rarely-used hostplants, without citing sources; the former is new. **MATURE LARVA** black in lateral view photo of larva on *Cirsium* leaf from Metchosin, Camas Hill, BC (A.G. Guppy) in Guppy & Shepard (2001), which shows a narrow cream spiracular line and a cream lateral band interrupted by reddish-brown BL1 scoli; head black. **PUPA** in adjacent photo from Metchosin seems to be ashy-gray (creamy), with the usual orangish crescent on front of each dorsal conelike bump.

### 2A. *PHYCIODES PALLIDA PALLIDA* (W. H. EDWARDS)

**DEFINITION.** Note that older larvae are distinguished from all other *Phyciodes* species by having orange all around the BSD scolus.

**HOSTPLANT RECORDS.** ~3<sup>rd</sup>-stage larvae found on *Cirsium undulatum*, N of Foxton, Jefferson Co. Colo., Sept. 4, 1998, fed *Cirsium arvense incanum* in lab. This record definitely confirms *C. undulatum* as a hostplant.

**EARLY STAGES. MATURE LARVA** body mostly white, but heart-band black, a black spot posterodorsal to BD2, a black dot on front of segment below heart-band, a wide black dorsolateral band, a blackish band above BL1 (and from rear of BL1 up to same blackish band), uns dark-brown, brownish-orange areas around & above BD2 and around BL1; scoli dark, except base of BL1 and all of BSV pale; head black, a cream dash on vertex, a gray crescent over eyes. **PUPA** medium-brown, rather uniform (except legs, proboscis darker on two pupae), cones rather small, the usual postmedian white dots on fw, etc.

### 2B. *PHYCIODES PALLIDA BARNESI* SKINNER

**EARLY STAGES.** Guppy & Shepard (2001) give photos of an egg cluster of 89 eggs, mature larva (dorsal view only), and pupa of *barnesi* from 21 km N Lilloet, BC, reared by Richard Beard. The mature larva photo provides more confirmation that *barnesi* larvae are much blacker than ssp. *pallida* larvae, thus *barnesi* seems to be a valid ssp. distinguished almost solely by the larva.

### 3B. *PHYCIODES ORSEIS HERLANI* BAUER 1975

**MISIDENTIFIED PHOTOS.** Pyle (2002) misidentified all four photos purported to be this species. All four were supposed to have been taken at “Madeira”, Calif., by Jack N. [not the error “A.”] Levy (see p 401, 396). The “Madeira” may refer to Madera, a town on the floor of the Central Valley of Calif., or to Madera Co. Both photos on p. 301 are females (not male as the top photo is labeled) of *P. pulchella montana* (the ups of these looks like *montana*, not *P. orseis*, and note especially the uph median band, which is orange with a spot of yellower at the rear, unlike *P. orseis herlani*). On p. 297 the left middle photo is *P. mylitta mylitta* (*P. orseis* has a complete row of submarginal black dots, whereas the photo only shows 3 black dots). The right middle photo on p. 297 looks like *P. pulchella*, which from the locality could be either *P. pulchella montana* or *P. p. deltarufa*.

The female of *P. orseis herlani* on p. 179 of Brock & Kaufman’s Butt. North Amer. (Kaufman Focus Guides) also seems to be a *P. p. montana* female, as the uph median band is yellower toward the rear also, and the upf looks more like the *montana* intergrade populations from E of the Sierras than pure Sierra *montana*.

**MTDNA.** The mitochondrial DNA of four individuals of *P. orseis orseis* and three *P. orseis herlani* (Wahlberg, Oliveira, & Scott 2003) showed that *herlani* clustered well within the more-variable ssp. *orseis*, so *herlani* seems to have resulted from some of the oranger individuals within ssp. *orseis* (ssp. *orseis* is more variable in wing pattern also, varying from black, to nearly as orange as the orangest *herlani*).

## B. *PHYCIODES THAROS* SPECIES GROUP

Mitochondrial DNA was sequenced (a long stretch of 1450 base pairs) in numerous *Phyciodes* (Wahlberg, Oliveira, & Scott 2003), and great variation was found, with most of the species being polymorphic (98 of 140 individuals had unique sequences). Therefore it was surprising that all the 18 *tharos* individuals clustered together in the phenogram, although a few *P. batesii* and a few *P. cocyta* had similar DNA. This surprising finding evidently provides genetic evidence that *tharos* is a distinct species, which has not absorbed mitochondrial DNA from other species such as *P. cocyta*, although *cocyta* and *batesii* may have gotten genes from *tharos*, due to hybridization both in ancient times and recently. *P. tharos riocolorado* and *P. tharos orantain* mtDNA fell within the variation of ssp. *tharos*.

The forewing costa is fairly rounded in *P. tharos*, *P. cocyta*, and *P. batesii*, whereas it averages straighter in *P. pulchella* and other *Phyciodes* (except *P. phaon* and *P. vesta* also have a fairly rounded fw costa).

#### 4B. *PHYCIODES THAROS THAROS* (DRURY) 1773

**ORIGINAL DESCRIPTION AND PAINTINGS.** The copy of the original description (Drury 1770-1773) in the BMNH describes the antenna club as brown ("The Antennae, are chequered with white and brown. The Extremities or Knobs, being brown."), and the painting of the butterfly in that copy has black clubs. But interestingly, another original copy of Drury--in CNC—paints the antenna clubs as blackish with orange tips! So evidently the antenna color varied from copy to copy. However, the CNC copy was painted too orange, because the antenna club was described as brown in text yet the painting shows it black and orange, and the unh marginal patch is described as "reddish-brown" yet is painted as orange. In fact all the tawny underside areas on a normal *Phyciodes tharos* are painted orange on the CNC Drury. Thus we must ignore the badly-painted copy in CNC. Also, the antenna club is drawn with a little nipple at the tip, which does not occur on real *Phyciodes*. The larger conclusion is that the description and illustration in Drury (1770-1773) is still hard to apply to a real insect, and could apply to *P. tharos* or to *P. batesii* as both species are known to have black or orange clubs, and the illustrations actually look more like *batesii*. But I designated the neotype *tharos* (Scott 1994) to fix the application of the name without upsetting traditional usage, and my neotype designation is still perfectly valid, no matter how variable or miscolored or misdrawn are the illustrations in the copies of Drury, and regardless of the nippled & elongated shape of the painted antenna club.

**SEARCH FOR THE ORIGINAL *THAROS* TYPE.** The original type is lost. Possibly it could have ended up in the Macleay Museum (University of Sydney, Sydney, Australia), which has several specimens of *Phyciodes tharos* (1m2f), *P. cocyta* (1m), *P. pulchella* (1m3f), and *P. mylitta* (1m), according to a photo sent by John Calhoun. The *tharos* are labeled with #3972, the *pulchella* with #2263, which are apparently accession numbers at the museum, as those numbers do not seem to be from any checklist, and a checklist would have given the two species nearby numbers anyway. The labels all seem to be in the same handwriting, and the *mylitta* label includes the words "*P. mylitta* Edw.", evidently proving that the labels date from the late 1800s when William Henry Edwards lived, and not from the time of Drury a century before. There seems to be no way to link those specimens to Drury. Maybe if the Macleay Museum received original Drury specimens a curator may have relabeled them and obscured their origin. John Calhoun states that probably none of Drury's specimens ended up in Macleay's collection via Francillon (the above numbers are not from Francillon's catalogue); most of Drury's British material was purchased by Edward Donovan in 1805; the remainder was broken up, with the "types" going to Georgia Milne; Milne's material was later acquired by BMNH, but none of it is apparently identifiable as Drury types, which are not labeled as types, and the original labels may not even still be attached. So, the original type is still lost. Drury's original collection catalogue is in BMNH, with a copy at Oxford. Moses Harris painted Drury's illustrations, which were sold in 1964 by the H. P. Kraus book firm (John Calhoun has a copy of the Kraus sale list). At any rate, my 1994 *tharos* neotype remains valid.

**MISIDENTIFIED PHOTOS.** The upper b/w photos of a male (probably from Wisconsin) in Ebner (1970) look like *P. cocyta* to me. In "Butterflies of West Virginia and their Caterpillars", by Allen (1997), the male upperside on plate 15 row 2, #1, from Springfield WMA, Hampshire Co., W. Va., Aug. 10, 1983, looks like it could be *P. cocyta* to me, although it could be *tharos* because some *tharos* lack the postmedian black line across uph and Allen presumably identified it as *tharos* because it presumably has a black nudum. In "Michigan Butterflies & Skippers" (Nielsen 1999), the first photo of *P. tharos* is really *P. cocyta*, as it has the large uph orange space without a black line, and the antenna club is orange; (the second photo does look like *tharos*); the third and fourth *tharos* photos (of male ups and uns) are also *P. cocyta* (large uph orange space and orange antenna club); and the fifth and sixth photos (female ups and uns) may also be *P. cocyta* (large size and orange antenna club) although females are harder to identify than males so the female identity is uncertain. The male upf of "tharos" in Wagner (2005) looks more like *P. cocyta* also, though it might be *tharos*.

**SPECIES DISTINCTION.** Porter & Mueller (1998) did an electrophoresis study on specimens of *P. "tharos"* and *P. cocyta* from Michigan and Ohio, which found relatively small differences between the populations, so they therefore claimed that *P. tharos* is conspecific with *P. cocyta*. However, all the "tharos" specimens that they analyzed (which I later examined) were actually *P. cocyta diminutor* (see below under *diminutor*), so their conclusion is invalid, and they actually proved only that Mich. and Ohio *P. cocyta* populations may belong to the same species.

**ANTENNA COLOR.** Antenna nudum color of *P. tharos tharos* is usually black, in contrast with *P. tharos orantain*, which has orange nudum. In southwestern U.S. and Mexico, the nudum is always (or almost always) black. However, the nudum color is somewhat more variable in *P. tharos tharos* in eastern U.S., and females have the nudum a little orangish on average. For example, in a Minn. family reared in 1999, the nudum of males was black, whereas the nudum of females was black except the very tip was orangish.

In western North Carolina and northeastern Georgia, Gatrell (2004) found the antenna club mostly black: 85% of males had the whole club black, 15% had the club mostly black but tipped with orange-red, while 25% of females had the whole club black, 70% of females had the nudum black at base grading to orange at tip, and 5% of females had the nudum all orange.

But surprisingly, *P. tharos tharos* from as far south as southwestern Mississippi often has orange nudum. Ricky Patterson sent numerous adults from Mississippi, which have antenna nudum as follows: Near the Mississippi River in SW Miss. (Vicksburg, Warren Co.) 19 males 1 female had black nudum, 4 females mostly black, 4 males 1 female brown, 2 females orange-brown, 2 males 1 female brownish-orange, 2 males intermediate, 26 males 26 females orange; and a family reared from an egg cluster from Vicksburg had 14 females (no males emerged!) with orange nudum. In extreme SE Mississippi (Van Cleve, Jackson Co.) 1 male has black nudum. In eastern Mississippi (Dorman Lake, Oktibbeha Co.), 4 males have black nudum, 1 female has orange-brown nudum. In extreme NE Mississippi (Cotton Spring, Tishomingo Co.), 3 males 7 females have black nudum, 1 female brownish-black, 1 female orangish-brown, 1 female dark-orange, 1 female mostly orange, 1 male 3 females orange. Thus the SW Mississippi adults actually have the nudum more often orange in males, and usually orange in females.

In the southern Appalachians, Ronald Gatrell found that all male *tharos* have black nudum, except occasional males have the nudum orange-tipped, and females are rather variable in nudum color with black or orange clubs. He finds that *tharos* from St. Louis, Missouri, have black nudum, but many have orange nudum. In coastal South Carolina, the nudum is black to orange.

Obviously, to identify *P. tharos tharos* and distinguish it from *P. cocyta*, one must rely on as many characters as possible, in adults and immatures. I have always been able to identify a female *Phyciodes* if I can get eggs from her and rear them to obtain a family of a dozen or more adults; but single specimens caught in nature of *P. tharos/cocyta/batesii* often cannot be identified. But one cannot rely on the antenna color alone, because some *P. tharos tharos* have orange antennae, and some *P. cocyta* (see below) have black antennae, and I recently found a couple *P. batesii saskatchewan* in Alberta with orange antennae.

**VOLTINISM.** There are at least three generations in S Minn. (Freeborn Co.), in June, mid-late July, and early Sept. I have found the first and third generations often, and the second was found in 1999 and 2004. The first generation evidently starts in late May or June depending on the lateness of spring.

**HOSTPLANTS.** Larva ~3<sup>rd</sup>-stage found on uns of *Aster laevis* leaf, NE Conger, Freeborn Co. Minn., June 21, 1998, reared to male adult emerged July 11, 1998. Cluster of 65 eggs found on *Aster simplex* leaf uns, 10 cm above ground on 40 cm plant, 2.5 mi. NE Conger, Freeborn Co., Minn., June 24, 2001.

**LARVAL COLOR.** Six more rearings (one family in Mississippi, and five families in Minnesota, detailed below) prove that ssp. *tharos* do not always have blackish older larvae as was thought. Actually the ground color varies, from mostly blackish in some families, to merely dark-brown in other families. Older larvae are frequently dark-brown, the same color as most *P. tharos* and *P. cocyta*, as well as blackish (the color of larvae previously reared from Minn.). However, the average color at least in Minnesota seems to be darker than *P. tharos orantain* and *P. cocyta*, and Mississippi larvae were blackish-brown, but larvae will have to be reared from many more areas to be sure. However, Paul Catling in Ont. and Charles Oliver in Penn. (all cited in Scott 1998) also stated that *tharos* larvae were darker than *P. cocyta*, so it seems safe to conclude that on average *tharos tharos* does have darker older larvae. In addition, the mature larva photo in Wagner (2005, maybe from Connecticut?) is blackish.

**EARLY STAGES** (Vicksburg, Warren Co. Mississippi, cluster of ~48 eggs laid in lab June 8, 1999 then sent by Ricky Patterson). **EGG** not seen, duration 6 days. **SILK WEB** very little, a little web on spot where 1<sup>st</sup>-stage molted into 2nd but none on feeding area. **1<sup>ST</sup>-STAGE LARVA** tan, with no apparent stripes, setae dark-brown, innards green after feeding, the usual creamier bumps on each segment (small middorsal, larger below that, then smaller, larger laterally); head & suranal plate dark-chitin-brown without pattern; duration ~4 days. **2<sup>ND</sup>-STAGE LARVA** tan or creamy-tan with green innards, has little pattern (a weak pattern only of chitin sclerites below setae); head has cream frontoclypeus and cream vertex stripe; duration 4-5 days. **OLDER-MATURE LARVA** overall ground color blackish-brown (varying from brownish-black in some, to dark-brown in others), a tiny bit paler above subdorsal cream band than below it, subdorsal cream band is 90% complete, much orange lateral to BD1 scolus and an orangish ring around it, orange in front of and behind BD2 scolus, a touch of brownish-orange ventroposterior to BSD scolus, a brownish-orange ring around BL1 scolus, the scoli all dark-brown except BL1 scolus tan and the tips of scoli cream; head has large white frontoclypeus spot. **PUPA**, most are slightly-orangish-tan, a few pupae a little browner, three are dark-brown with strongly-mottled contrastingly-creamy wings, most have wing case weakly mottled but a few are strongly mottled, most have moderate discal spot on wing case but one has weak spot; duration ~10 days. **DURATION** from oviposition to adult emergence in lab averages 37.4 days for females (14 adults were reared, but strangely all were females for some unknown reason [female Lepidoptera are the XY sex]).

**EARLY STAGES** (Minn., 2.5 mi. NE Conger, Freeborn Co., 3<sup>rd</sup>-stage larva found on *Aster laevis*, June 21, 1998).

**MATURE LARVA:** Ground color blackish-brown (paler in color than the average of the previous larvae I reared from *Aster cordifolius* in Freeborn Co. [Scott 1994], but a few of the previous larvae were blackish-brown like the current larva whereas most previous larvae were blacker; thus some larvae resemble *P. cocyta diminutor* from Freeborn Co. in ground color), subdorsal cream band 95% complete, along line of spiracles are conspicuous long white dashes, the usual cream lateral band running along bottom of BL1 scoli, the orange areas are much orangish than on the previous larval family from Freeborn Co. (brownish-orange beside BD2 in subdorsal cream band, brownish-orange ring around BL1 scoli, a little

orangish patch anteroventral to BSD, a tiny brown area at anteroventral base of BD1); upper three rows of scoli black with conspicuous cream tips, except BL1 scoli orangish-tan with cream tips; frontoclypeus has large white triangle (head resembles fig. 222 of Scott [1994] except white crescent around eyes is narrower). **PUPA:** rather uniform orange-tan with comparatively weak brown mottling, wing mottling very weak; cremaster shouldered, 0.9 mm wide on one male; duration 9 days in lab for a male pupa.

**EARLY STAGES** (Minnesota, Hall of Humes Lake, Freeborn Co., two egg clusters [26 eggs and 58 eggs] laid in lab by a female Sept. ~27, 2000). **SILK WEB** almost absent, only a little on spot of leaf where 1<sup>st</sup>-stage larvae molted into 2<sup>nd</sup>-stage. **EGG** light-green. **1<sup>ST</sup>-STAGE LARVA** yellowish-tan or greenish-tan, with no pattern, innards green, the usual cream bump under each long seta; head & collar & suranal plate chitin-brown; duration ~3 days. **2<sup>ND</sup>-STAGE LARVA** tan to slightly-greenish-tan with brown bands, so overall appearance is brownish; the usual middorsal brown heart-line and a brown line beside it and subdorsal brown band and sublateral brown line; head brown with the usual cream triangle on frontoclypeus and cream stripe on top of each side of head; duration 2-3 days. **OLDER LARVA** dark-brown (paler than the blackish larvae previously reared from this county) in most larvae and blackish-brown in some (ground color a little paler above subdorsal cream band than below it), subdorsal cream band nearly complete (only ~80% complete in about 20% of larvae), with a small brownish-orange patch anterolateral to BD1 scolus, orange (sometimes light-orange) in front of and behind BD2, a small brownish-orange patch posteroventral to BSD, an orange (light-orange on a few larvae, brownish-orange on some larvae) ring around BL1 (except light-orange or orange around BL1 on T1-2), scoli BD1 & BD2 are dark-brown, BSD scolus blackish-brown, BL1 tan, BSV blackish, all scoli have cream tips; head has the usual smaller to large cream triangle on frontoclypeus, a cream V ventrolateral to it extending to neck, and the usual cream stripe with enlarged anterior end on top of head. **PUPA** color differed in the two egg clusters even though they had the same mother (and probably the same father); cluster 58 pupae were usually orangish-tan, but some were light-orangish-tan, some creamy-tan, some darker-creamy-tan (including one mottled-wing creamy-tan), wing case usually moderately mottled, a few strongly mottled; cluster 26 were all orangish-tan, except for one runt which was dark-orange-tan, most had wing case moderately-mottled, some strongly-mottled; duration ~10 days. **DURATION** from oviposition to adult in lab about 34 days males, 35 days females, males emerged an average of 0.9 days prior to females in lab.

**EARLY STAGES** (Minnesota, 3 mi. NE Alden, Freeborn Co., female laid eggs in two clusters of 36 & 96 eggs, June 25, 2001). **EGG** duration 6 days in lab. **MATURE LARVA** very dark on most larvae (almost blackish-brown), but some just dark-brown (and these are slightly lighter above subdorsal cream band than below it whereas most larvae are same color); subdorsal cream band varies from usual (wide) and 80% complete, to narrow and 60-70% complete, to very narrow and only 30% complete; paler spot below BD1 usually brown & small, but orange-brown in palest larvae; beside BD2 the subdorsal band is brownish-orange on most larvae (some are orange, some orangish-brown); some larvae have a small orange-brown spot below BSD scolus; ring around base of BL1 scolus orangish-brown (some larvae brownish-orange); spiracular cream line weak to strong; scoli tipped with cream; most scoli very dark, but BL1 scolus color dark brown (paler on thorax) but tan on some larvae; head pattern normal, always with cream spot on frontoclypeus. **PUPA** usually ochre-tan, many are creamy-tan; wing case moderately to strongly mottled.

**EARLY STAGES** (Minnesota, 2.5 mi. NE Conger, Freeborn Co., June 24, 2001, cluster of 65 eggs found on *Aster simplex* leaf uns). **MATURE LARVA** nearly black on most larvae, but some blackish-brown, all are same color above as below subdorsal cream band; subdorsal cream band narrow, varying from 70% to only 30% complete; paler spot below BD1 small and brown; beside BD2 the subdorsal band is orange-brown (but some larvae orangish-brown, some brownish-orange); some larvae have a small orange-brown spot below BSD scolus; ring around base of BL1 scolus brownish-orange (some larvae orange-brown or orangish-brown); spiracular cream line strong (weak on some larvae); scoli tipped with cream; most scoli very dark, but BL1 scolus color brown (tan on some larvae); head pattern normal, always with cream spot on frontoclypeus. **PUPA** nearly always ochre-tan, several more strongly-mottled pupae are slightly creamier; wing case usually weakly mottled (with a central brownish spot), but some moderately mottled, a few strongly mottled.

**EARLY STAGES** (Minnesota, 3 mi. NE Alden, Freeborn Co., female laid cluster of 93 eggs in lab June 23, 2001). **EGG** duration 6 days in lab. **MATURE LARVA** dark-brown on all larvae (the palest lot in 2001), all larvae are same color above as below subdorsal cream band; subdorsal cream band fairly wide, from 70-90% complete; paler spot below BD1 small and light brown; beside BD2 the subdorsal band is orange on most larvae, but some are orange-brown; most larvae have a small orangish-brown spot below BSD scolus (but many just brown there); ring around base of BL1 scolus orange-brown (some larvae brownish-orange); spiracular cream line strong on most larvae (some weak); scoli tipped with cream; most scoli very dark, but BL1 scolus color tan, to brown; head pattern normal, always with cream spot on frontoclypeus. **PUPA** usually ochre-tan, a few pupae slightly creamier-tan; wing case always moderately to somewhat-strongly mottled.

**EARLY STAGES** (W N.C./N Ga., Gatrell 2004). **EGG** (Gatrell fig. 16) pale-greenish when laid. **MATURE LARVA** (Gatrell figs. 11-13) brown or dark-brown, with the usual pattern, orange-brown beside BD2 scoli, brownish-orange beside BL1 scoli, scolus tips cream; head black with usual pattern, white areas large and most of frontoclypeus filled with white. **PUPA:** nearly all pupae were brownish-tan (Gatrell figs. Ma, Mb), creamy-tan pupae were uncommon, and

blackish-gray pupae (Gatrell fig. L) rare; cones on thorax a bit larger than *P. diminutor ncognitus*. Duration egg-adult 35 days.

### **5A. *PHYCIODES COCYTA COCYTA* (CRAMER) 1777**

**HOMONYMY OF MORPHEUS.** The new ICZN rules affect homonymy. Rule 23.9.5 states that homonyms not used in the same genus after 1899 are not to be rejected, but are to be maintained unless and until the commission were to rule otherwise. Evidently the ICZN pulled the date 1899 out of a hat and installed it in the code, despite the instability of nomenclature that this will cause (obviously the ICZN cares very little about stability of nomenclature). Rule 23.9.6 does not allow listings in nomenclators, indexes, or lists to count as “usage”. According to these rules, one might think that *morpheus* is a valid name, that has to be used instead of *cocyta*. dos Passos (1969) did use both *morpheus* names in the same genus *Papilio* after 1899, however that paper was a synonymous list so is disqualified under 23.9.6. However, Scott (1994, p. 35) used *Papilio morpheus* Pallas 1771 and *Papilio morpheus* Fabricius 1775 in the same paper, after 1899, in his discussion of their homonymy, and that p. 35 was not a “nomenclator, index, or list”, so it satisfies 23.9.6. Therefore, the name *morpheus* still cannot be used. And obviously, Scott (1994) only had to satisfy the 1985 ICZN rules, because the new rules had not yet been published.

**DEFINITION.** Layberry et al. (1998) treated *P. cocyta* and *selenis* as synonyms in their Butterflies of Canada book. However, they did not say how many from Nova Scotia they examined. Perhaps they are similar, but I would like to examine more specimens, as the *cocyta* unh appeared to be a little darker on average to me (my collection currently has only 14 from Nfld. and one from N.S., and from nearby areas has 10 *selenis* from Maine). Ronald Gatrell (pers. comm.) has examined more specimens from N.S.–Nfld., and wrote me that the uns is darker, and he thinks that *cocyta* is a valid ssp. compared to *selenis*.

### **5B. *PHYCIODES COCYTA SELENIS* (KIRBY) 1837**

**SYNONYM MARCIA** (W. H. Edwards) 1868. Gatrell (2004) has designated a specimen from the Carnegie Museum as the lectotype of *marcia*. This specimen (figured in his fig. 43) is a male evidently of *P. cocyta*, from Kanawha River (the town of Coalburgh, which was renamed as Cabin Creek in 1894 according to Gatrell), Kanawha Co. W.Va. This lectotype male has orange nudum and looks like typical *P. cocyta*. Gatrell examined Edwards' original specimens in the Carnegie Museum and found—correctly it seems—that Brown's (1966) lectotype of *marcia* was invalid because it was not a syntype of *marcia*. Gatrell found other Edwards' specimens that evidently represent *P. cocyta* (in fact most of the specimens in Edwards' collection at the Carnegie Museum that Edwards labeled “*tharos*” from Edwards' home in Coalburgh W. Va. were actually *P. cocyta* and rather few were *P. tharos*), and chose the lectotype *marcia* among those *P. cocyta*. Gatrell's decisions regarding *marcia* and his new *marcia* lectotype seem correct to me (Scott 1998 pointed out numerous reasons why Brown's lectotype *marcia* was invalid, including that it was not a syntype of *marcia*, and Gatrell confirms that Brown's lectotype *marcia* was invalid), and are welcome in order to stabilize the nomenclature. Gatrell (2004) states that Brown's *marcia* lectotype was the model for Edwards' first painting of *marcia* in Butterflies of North America (shown on Gatrell's fig. 39a), and thus the lectotype must have had a black antenna club and therefore most likely was *P. tharos*. But Brown's lectotype is obviously a female and the painting looks like a male to me and is labeled a male, and they differ on the upf margin and unh submargin, so I don't think one can confidently say that Brown's lectotype was the model for the painting, so I think the color of the lost antennae on Brown's lectotype will remain unknown (Brown's lectotype still could be *P. tharos*, however).

Scott (1998, p. 7) erroneously mentioned that Hunter N.Y. was probably named from A. Hunter or his relatives. Actually the “A. Hunter” on some of Edwards' labels means that the specimen belonged to form A (among forms A, B, C, and D, Edwards' four labels for the degree of melanism on unh), and was from Hunter N.Y. There was no person named A. Hunter. Gatrell (2004) usefully notes that the words Ka, Kan, and Kan<sup>a</sup> on labels of many Edwards specimens in the Carnegie Museum actually mean Kanawha River W.Va.; they do not mean Kansas.

Edwards described *marcia* as being giant in size. But F. M. Brown (Trans. Amer. Ent. Soc. 95:173, 1969) reported that Edwards had a peculiar method of describing a butterfly's size: he measured one forewing length and then doubled it. Thus his wingspan measurements do not correspond to most people's measurements today. A series of 15-20 from Virginia (2 mi. N Buffalo Gap, Augusta Co., July 2, 1983, Paul A. Opler, in Gillette Museum, Colorado State Univ.) is moderately large in size though.

Opler & Krizek (1984) state that *marcia* (as “*pascoensis*”) in Va.-W.Va. is univoltine, flying June 29 to July 18 in W.Va. And Allen (1997) states that *P. cocyta* (as “*selenis*”) in W.Va. flies in June into late July (July 12 for the four specimens on plate 15)(the first male in row 2, caught on Aug. 10 from Hampshire Co., looks like it might be *cocyta* also based on upf, though it should probably be called *tharos* as Allen labels it, since it probably has a black antenna club if he identified it as *tharos*). Based on this voltinism and moderate size, perhaps these Va.-W.Va. critters should be assigned to the same taxon as boreal *P. cocyta selenis*, just as Gatrell (2004) assigned W.Va. *marcia* to *P. cocyta*. (Of course we need more study of these populations in the east, to determine the relationship between univoltine *selenis* and bivoltine *diminutor* and univoltine *marcia* and bivoltine *incognitus*).

**NEOTYPE OF SELENIS.** Norbert Kondla informed me that the original description of *selenis* (Kirby) 1837 is sufficiently ambiguous as to be applicable to *Phyciodes batesii* or *P. pulchella*, as well as to the species it has been assigned to, *P. tharos* and *P. cocyta*. He is correct, so an analysis of the original description is necessary now, together with some taxonomic action to fix the name more precisely.

The original description is as follows between the +++ +++ lines (Kirby published no illustration). I have attempted to make the type-faces similar to the original:

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(404) I. \* MELITAEA SELENIS. *Crescent Melitaea.*

Melitaea tharos. Drury. *Illustr. ii, t, lxxi, f. 5, 6?*

*M. (Selenis) alis integerrimis: primoribus supra nigro-fuscis fulvo maculatis et subfasciatis, subtus fulvis nigro et pallido maculatis; secondariis supra nigris fulvo maculatis, macula magna discoidalis irregulari fulvo; subtus pallidis fulvo subfasciatis et nebulosis; lunula marginali albida.*

Crescent Melitaea, wings very entire; primaries above black-brown, spotted and partially banded with tawny; underneath tawny, with black and pallid spots; secondaries above black spotted with tawny, with a large discoidal irregular orange-tawny spot; underneath pallid, clouded and partially banded with tawny, with a whitish marginal crescent.

Expansion of the wings 1 inch and 5 lines.

Taken in North America.

#### DESCRIPTION.

Antennae black, annulated with white; knob black, compressed; primary wings dark-brown, spotted, and partially banded, with fulvous deeper or paler, viz. a series of five irregular spots, the mesal one the largest and palest; a transverse discoidal angular forked band, and a pale marginal crescent; the margin is marked with very indistinct whitish crescents; secondaries above brown, with a large discoidal tawny-orange spot, in which anteriorly two areas are formed by confluent brown lines; and posteriorly there is a series of round black spots, those nearest the anal angle being the largest; in the brown margin are five whitish crescents, three of which are evanescent; the two nearest the above angles being most conspicuous. The underside of the primaries is tawny-orange with paler spots at the apex of the wing; next the interior margin is a sesquialterous black spot; next the anterior is an abbreviate macular band of the same colour, consisting of four black spots; and adjoining the anal angle is an angular, abbreviated, black band; parallel with the posterior margin is an indented orange line. The underside of the secondaries is tawny, at the base reticulated and clouded by darker lines and spots; the apex also is clouded, and at the angles reticulated; parallel with the posterior margin is a series of brownish-black spots; at the margin, between the fifth and sixth nervures, is a whitish crescent, two or three pale evanescent ones are observable also near the posterior or external angle.

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Kirby mentions only "North America" as the locality. However, Kirby (1937) also named *Lycaena dorcas* from latitude 54°, he named *Callophrys augustus* from 54° latitude, he named *Erebia discoidalis* from Cumberland House 54° N, "Manitoba" [now in Saskatchewan], and he named *Polygonia c-argenteum*, which the Miller/Brown checklist (Miller & Brown, 1981) suggests was taken at 54° latitude at Cumberland House? So, the locality of Cumberland House 54°N Saskatchewan seems reasonable. Both *P. batesii lakota* (which has a marginal unh brown patch however) and *P. cocyta* occur there.

What species was Kirby describing? He cites Drury's figs. "5 and 6?", the nameless figures which were in a later volume named *P. tharos* by Drury, probably because he thought that *selenis* resembles those figures (at least fig. 5), and figure 5 resembles a too-dark *P. tharos* or *P. batesii* or even *P. pulchella*; however, Kirby's description does not match Drury's fig. 5 in many ways (on upf, uph, unf, and unh). The antenna knob is described as black, which best fits eastern *Phyciodes batesii* or *P. tharos tharos* or some *P. pulchella* ssp. which have black nudum (*pulchella*, *camillus*, etc.); however it also fits some females of *P. cocyta* which have brown nudum (which makes the knob look black). The dorsal forewing is described as dark-brown, which might fit most *P. batesii* and *P. pulchella* ssp. more than *P. cocyta* or *P. tharos*, although some females of *P. tharos* and *P. cocyta* are quite dark (see the *P. cocyta* figs. 125 & 126 in Scott 1994), but perhaps Kirby's dark-brown refers only to the border color, because all *Phyciodes* are dark-brown around the paler spots. The dorsal forewing is described as having fulvous deeper or paler, which best fits *P. pulchella*, but also fits *P. batesii*, and some *P. cocyta* and *P. tharos*. The indistinct whitish upf crescents best fit *P. pulchella camillus* and *P. pulchella shoshoni*, and some individuals of other taxa. The ventral hindwing is not described as having a brown marginal patch (unless "the apex is also clouded" refers to this brown patch?), which fits *P. batesii batesii* and *P. pulchella shoshoni* the best, although some individuals of other species fit (such as the female *P. cocyta* in Scott [1994] fig. 122). The dorsal hindwing is described as having a "large discoidal tawny orange spot", and "posteriorly there is a series of round black spots", which

definitely fits *P. cocyta* the best, and well-describes the large orange patch on upf that is the main diagnostic wing characteristic of *cocyta* (also, Drury's fig. 5 lacks this large orange patch). The black spots described on unf fit all *Phyciodes*, except the weakly-spotted *P. pulchella* ssp. (*pulchella*, *owimba*, *tutchone*). The "abbreviated macular band of...four black spots" beside anterior margin of unf evidently refers to the median band on all *Phyciodes* except the less-spotted ssp. of *P. pulchella* (ssp. *pulchella* to *tutchone*), and no mention is made of the subapical costal patch on unf that is the best way to separate *pulchella* from *tharos/cocyta/batesii* (this patch is orange-brown in *pulchella*, mostly black in the others), which might mean that this patch was not black, and therefore that the unf was like that of *P. pulchella camillus* (but Kirby's description of upf or unh does not fit *camillus*). The dorsal forewing is described as having a "transverse discoidal angular forked band", which does not fit *Phyciodes*, the "five irregular spots" on upf with the "mesal one the largest and palest" does not fit many *Phyciodes* either, but the marginal crescent on dorsal forewing and ventral hindwing does fit *Phyciodes* (and fits *Chlosyne nycteis*), and the description of ventral hindwing does fit *Phyciodes*. The "indented orange line parallel with the posterior margin" on unf is presumably the zigzag rufous submarginal line on all *Phyciodes*. The sex of the adult described is not clear, as the wing shape was not described, although Drury's painting was evidently a male; the black spot described on rear of unf might belong to a male, but the black band on unf tornus is more likely to belong to a female.

The description fits *Chlosyne nycteis* in some traits, but not better than *Phyciodes*. The description mentions black antenna knobs and a sesquialterous (meaning a ratio of 1.5 to 1) black spot on interior margin of unf and tawny unh, whereas *nycteis* has an orange knob and usually lacks the spot and has the unh whitish on base and submargin, so the description cannot apply to *C. nycteis*.

Overall, perhaps more traits in the description fit *P. batesii* than any other species. But the description is rather ambiguous and could apply to other *Phyciodes*, and it could apply to either sex. However, the description does seem to describe well the large orange patch in middle of upf that is diagnostic of *P. cocyta*. And previous authors thought that *selenis* applied to *P. tharos* (including *cocyta*). So, I conclude that the description could refer to *P. cocyta* (some female *cocyta* have black antennae), and I definitely do not want to replace such stable names as *batesii* or *camillus* by *selenis*, especially based only on ambiguous description and worthless locality and missing illustration and offhand citation of someone else's figure that does not match description. And declaring the name to be a nomen dubium solves nothing because a later author could revisit the issue and use *selenis* to replace a good stable name. Therefore, I am designating a neotype of *selenis* as a *P. cocyta* specimen from near Cumberland House Sask., specifically from The Pas Manitoba which is a little east of Cumberland House and downriver.

I hereby designate a **neotype** male from Grosky Rd., The Pas, Manitoba, June 15, 2002, collected by Walter Vladamir Krivda. I have attached another label "NEOTYPE [in red] of *Melitaea selenis* W. Kirby 1837, now *Phyciodes cocyta selenis*, neotype designated by James A. Scott, 2003" It was fig. in color on plate V in *Papilio* [New Series] #12 (Scott et al. 2006), which was published the same time as the present paper, and will be deposited in BMNH.

**STATUS OF PASCOENSIS.** I have not seen many of these, but I don't see much if any evidence to suggest that it is a distinct ssp. Jonathan Pelham tells me that he is not sure that it is distinctive either. He states that NE Wash. and the Blue Mts. of Wash. have single-generation populations like Rocky Mts. ones; an isolated segregate in Chelan Co. looks like those also; then in the Columbia Basin of Wash. populations are very scattered and not very common, they have two generations (the first gen. smaller in size) wherever the number of generations has been determined.

**STILL MORE MISIDENTIFIED PUBLISHED PHOTOS.** In "Butterflies Through Binoculars. The East", Glassberg (1999) switched photos 9 and 10 on plate 32 (the captions and text are fine): photo 9 is actually *P. batesii batesii* female from North Carolina (also note that the leaf on which the female is resting is the same leaf on which the female *batesii* in photo 7 is resting); photo 10 is actually *P. cocyta* female (or possibly *P. batesii lakota* female) from McNair, Minn. See next paragraph.

**EARLY STAGES.** The larva photo of *P. "phaon"* in Wagner (2005) looks like *P. cocyta* to me, as noted below under *P. phaon*.

**HOSTPLANTS OF *P. COCYTA SELENIS AND "PASCOENSIS"*.** 28 1<sup>st</sup>-stage larvae found on *Aster laevis*, Tinytown, Jefferson Co. Colo., Aug. 17, 1998. This family had a strong silk sheen web on leaf underside made by 1<sup>st</sup>-stage larvae. Pyle (2002) reports that Thea Pyle found a larva on *Erigeron philadelphicus* in the Selkirk Mts. of Wash. that pupated the next day but died of wasp parasitoid; this cannot be considered to be a documented host because the larva could have been another species (as Pyle notes), and because larvae wander some meters before pupation and this larva could have just wandered onto this plant from its real host. Jonathan Pelham found larvae definitely of *Phyciodes* (not *Chlosyne* as Scott 1998 questioned) on an apetalous *Aster* (evidently *frondosus*) in the Columbia Basin of SE Wash., which may be a host (unless the *Phyciodes* was *P. pulchella*).

## 5C. *PHYCIODES COCYTA ARENACOLOR* AUSTIN 1998

This was named as a ssp. of *P. pascoensis* by Austin (1998a), from Warm Springs, 1798 m, Steptoe Valley, White Pine Co. Nevada, and described as being limited to that valley. Based on the published description and accompanying b/w photos of male holotype and female allotype, specifically the stated paler tint to the orangish median upf band, this taxon

would appear to be similar to the *Aster foliaceus* variety of *P. cocyta selenis* detailed by Scott (1998) from western Colorado. However I examined 3 males and 3 females of the subspecies that Austin sent me, and based on those and the O.D. photos I find that it is a distinctive local subspecies, characterized by the very large uph black postmedian dots, by the whiter unh (tawny or slightly paler in males, but paler, whitish-ochre or whitish, in females), by the usually melanic upf of females (melanic females do occur in other ssp., and are fairly frequent in the Front Range of Colo., but are not common in those ssp.), and by the slightly paler orangish median upf band of males. I should rear this butterfly to study larval and silk nest characters, to be sure that it belongs to *P. cocyta* and not to *P. batesii anasazi*. But I am rather certain that it belongs to *P. cocyta*, as adults look like *P. cocyta* to me, and the host of *P. batesii anasazi*, *Aster glaucodes*, is absent in Nevada. Also, the melanic females suggest that this butterfly is *P. cocyta*, as *P. batesii anasazi* lacks melanic females, although some are darker on upf. George Austin (e-mail to J. Scott) states that the **hostplant** of *arenacolor* is *Aster adscendens*, which also suggests that the butterfly belongs to *P. cocyta*, and not to *P. batesii anasazi*.

*P. cocyta arenacolor* is similar to Scott's (1998) *Aster foliaceus* variety only in its paler postmedian upf band of males. That variety could range from W Colo. to Nevada and even to Washington, as *Aster foliaceus* is very common all the way to Washington (the male from Chelan Wash. on p. 299 of Pyle [2002] has the upf median band a little paler also, but another male on p. 288 does not have a paler upf median band). But I would have to look at many more specimens from places like S Idaho and E Ore. and SE Wash. and Utah to determine the range of that variety. The lectotype of *pascoensis* has the median band across upf a bit paler, but not much. Most Utah lepidopterists have not yet properly distinguished *P. cocyta* from *P. batesii anasazi*, so there is not much help there.

**HOSTPLANT OF *P COCYTA ARENACOLOR*.** *Aster adscendens* at TL, at least by association (G. Austin, pers. comm.).

#### 6A. *PHYCIODES DIMINUTOR* (OR *P. COCYTA*) *DIMINUTOR* SCOTT 1998

**ANTENNA CLUB.** A family has been reared in which males offspring have orange nudum, females mostly brown. And variation in nudum color was found in N Ohio as well.

#### RANGE, AND MISIDENTIFICATION IN PUBLICATIONS INCLUDING AN ELECTROPHORESIS STUDY.

This taxon has evidently been found in N Ohio. Porter & Mueller (1998) did an electrophoretic study of adults from northern Michigan, southern Mich., and northern Ohio. They reported that the N Mich. samples were *P. cocyta*, and the S Mich. and N Ohio samples were *P. tharos*, and reported that gene exchange between these areas (as demonstrated by electrophoresis) was sufficient to prove that *P. cocyta* and *P. tharos* are conspecific. However, I borrowed all the specimens used in their electrophoretic study (wings and antennae, since the bodies had been ground up), and found that actually all of them are *P. cocyta*; therefore, their electrophoretic study actually seems to demonstrate (if one believes that electrophoresis can prove species status) only that *P. cocyta selenis* is the same species as *P. cocyta diminutor*, it does NOT demonstrate that *tharos* and *cocyta* are conspecific.

I examined each adult that Porter & Mueller (1998) used for electrophoresis, for these traits: forewing length, presence/absence of a line across the central uph orange area, unh marginal patch size and color, antenna nudum color, and antenna club shape. A few of the specimens were missing antennae, and a few had the antenna club broken so I could not determine its shape, but the rest were scored for these traits. A few of the specimens were mislabeled as to sex (two from Providence and three from Allenville were labeled as males but are actually females).

I found that all of Porter & Mueller's samples—including those called *P. tharos*--are *P. cocyta*. Their *P. cocyta selenis* specimens from N Michigan (Rockview & Allenville in Mackinac Co., late July) are large (16-19 mm fw length; *tharos* is smaller), with a big space on middle of uph where the black line is missing (*tharos* tends to have a black line across this space), the antenna nudum is orange (it is black with tiny white microscopic sensillae in *tharos*), the antenna club is long (elliptical or elongate)(it is shorter—oval—in *tharos*), and the brown marginal unh (ventral hindwing) patch is big and not dark (it tends to be narrow and blacker in *tharos*). (The color of the crescent inside the unh marginal brownish patch does not differ significantly between *tharos* and *cocyta*, and is whiter on females of all *Phyciodes*. The color of the lines crossing unh averages darker in *tharos*, but that character is merely correlated with the darker unh patch character.)

Their adults from Pinckney in S Michigan (Washtenaw Co., June 15) are very similar to N Michigan adults and are also *P. cocyta selenis*, they are also large (16-18 mm), with orange nudum, elliptical club, a wide open space on uph, and an unh brown patch typical of *cocyta*.

Their adults from NW Ohio (Providence, Lucas Co., July 30, and Cygnet, Wood Co., Sept. 5) are also *cocyta*, they are rather large (male fw length 16-17, rarely 15 & 18 mm), the uph usually has a large space, the nudum is usually orange (rarely blackish), the club is elliptical or even elongate, and the unh marginal patch is mostly like *cocyta*.

Their adults from Salem in NE Ohio (Columbiana Co., June 4) also seem to be *P. cocyta*, they are fairly large (fw length 15-17 mm, and adults are the spring form *marcia* so the equivalent later form would presumably be even larger), most adults have an orange uph space (few have the line across it), the unh marginal patch is like *cocyta* (though they are form *marcia* so these brown areas may be larger merely because of the *marcia* spring form), the antenna club is somewhat intermediate in shape but averages a bit closer to *cocyta*, however the nudum is usually blackish (only one male is orange, although most of the blackish-nudum males have brown and sometimes orange steps on nudum)(on Porter & Mueller's

Table 5 on bottom of p. 197, the numbers 6 and 1 in the Salem female box should be transposed, actually six have black and one has orange nudum). This Salem sample is the only one that makes one wonder if they represent hybrids, because they mostly have black nudum. I conclude that the Salem adults are *P. cocyta* that have blacker nudum, perhaps because they have introgressed with *tharos*.

None of Porter & Mueller's samples seem to represent more than one species per locality, because the traits within each locality are not linked in a way that suggests two species (in other words, an individual that possesses a trait typical of *tharos* is not likely to also have another trait that looks like *tharos*).

It is very clear that Porter & Mueller's samples did not include true *P. tharos tharos*, which is the little taxon (13-16 mm fw length of males) with the line across uph, the black nudum, the oval club, with a narrow blacker unh marginal patch. That little taxon has invaded all of southern Ontario north to Ottawa, where it flies with *P. cocyta* without much interbreeding, so it still seems reasonable that they are basically separate species. That same little *tharos* taxon is the only inhabitant of Kansas, Texas, Arizona, most of the SE U.S. and Mexico, and extends north to S Minnesota where it also flies with *P. diminutor*, and it must live all over Ohio including northern Ohio also, which is close to Ontario.

*P. tharos*, *P. batesii*, and *P. pulchella* all have populations with orange antennae, and others with black antennae. The adults from Salem in NE Ohio evidently represent the first known population of *P. cocyta* that has mostly-blackish antennae. Porter & Mueller's electrophoresis study shows the Salem population to be like the two multivoltine NW Ohio populations, thus it seems to be a *cocyta* population with blackish antennae. The book Butterflies of Ohio (Iftner et al. 1992) states that antennal club coloration is unreliable in Ohio. That statement may be partly correct, but is not completely true, and has insufficient factual basis since the species have been confused in Ohio; nudum color is surely still useful for identification, even though each species *tharos* and *cocyta* may vary somewhat in this trait in Ohio (and elsewhere such as Mississippi). Ohio *Phyciodes* need more study. I presume that with a lot more study, the *Phyciodes* in Ohio will prove to segregate reasonably into two species *P. tharos* and *P. diminutor/cocyta*, though variation will surely occur such that many wild-caught specimens cannot be reliably identified.

Butterflies of Ohio (Iftner et al. 1992) identified two specimens from Highland and Hamilton Counties in SW Ohio as *P. cocyta* ("*pascoensis*"), but these are almost certainly misidentified *P. tharos*, because both are far out of range, and it is difficult to be certain about the identification of individual specimens (especially when range extensions are in question). However, the first photo in that book (plate 28 row 5 middle) from Sandusky Co. Ohio, does look like *cocyta*, and resembles Porter & Mueller's specimens from NW Ohio (the other two males they show [row 6 right from Delaware Co. in middle of state, and row 7 left from Franklin Co. in center of state] look like *tharos* to me). Thus it is certain that *P. cocyta* occurs all across northern Ohio; it evidently occurs in Lucas, Wood, Sandusky, and Columbiana Cos., and has two or three flights (L May-E June, L July, E Sept., the latter two perhaps part of a second Aug. generation).

Probably all of the populations with orange nudum in Pennsylvania that Charles Oliver studied and called *tharos* were also *P. cocyta/diminutor*.

Scott (1998) gave the multivoltine eastern *cocyta* the name *P. cocyta diminutor* to call attention to it, to encourage eastern U.S. lepidopterists to look for it among their *tharos* series, and that name may fit Porter & Mueller's N Ohio samples. The northern New York specimens I have seen seem to be *P. cocyta diminutor* like S Minn. topotype populations, as they are multivoltine and are smaller late in the season. The contribution of photoperiod/ temperature to wing size has yet to be determined precisely, but I rear all my *Phyciodes* in the basement that does not vary much in temperature, and I find that the size of the 4000-5000 *Phyciodes* that I have reared does not differ much if at all from their size in nature. (The uph space versus black line and antenna club color does not differ from nature either.)

According to Paul Opler (pers. comm.), a student of Tom Vawter did an electrophoresis study comparing about 40 *P. tharos* and 40 *P. cocyta* from Pendleton Co. W. Va., where the two are sympatric but mostly allochronic, and found that the two species differed significantly at three loci. Thus there is no electrophoretic evidence that the two are one species, while there is electrophoretic evidence that they are distinct species.

**TAXONOMIC STATUS OF DIMINUTOR.** Some might want to lump *diminutor* into the synonymy of *P. cocyta* as being just the multivoltine part of its range, but I prefer to keep the name for now to call attention to it and help the process of distinguishing between *P. tharos* and *P. cocyta* in the NE U.S. There is some evidence that *diminutor* could be a separate species, though the evidence is somewhat uncertain I think. Species status is based on the apparent sympatry or near-sympatry of univoltine *cocyta selenis* with *diminutor* in Ont. and N.Y. (Paul Catling's studies cited by Scott 1998, and Alan Wormington's findings cited by Gatrell 2004 etc.). Perhaps Charles Oliver found both species in Pennsylvania, as he found some univoltine and some bivoltine populations of his *cocyta*-like *Phyciodes* in Penn.; his specimens are evidently at Yale Peabody Museum, and might be worthwhile to reexamine carefully. Further observations are needed. Porter & Mueller (1998) concluded that based on electrophoresis, *cocyta selenis* from Mich. is the same species as what I identify as *diminutor*-like critters in N Ohio (as noted above), which suggests that *cocyta* and *diminutor* are not separate species (but their study was based only on electrophoresis, rather than traits that are known to distinguish various *Phyciodes*, so may be useless for that purpose). Further studies are needed in Ohio. The "Curse of *Phyciodes*" continues. It seems best to treat *diminutor* as a separate species for now, if only to encourage people to look for evidence that it is not. Is it possible for

*selenis* to have one generation in a valley bottom while *diminutor* has two generations on a nearby ridge, and still be just one species because they do not meet each other much? Most lepidopterists wouldn't think it's possible.

If someone wants to pursue a detailed scientific study of the relationship between *cocyta* and *diminutor* (or *diminutor* and *incognitus*), here is what should be done. Studies of electrophoresis and DNA phylogeny of eastern *Phyciodes* (where *cocyta* and *diminutor* are sympatric, or *diminutor* and *incognitus*) should incorporate careful identification through rearing. A survey should be done to find where the various phenotypes occur, a locality where *cocyta* and *diminutor* are sympatric and common should be found, a search should be made there for eggs/young larvae (the easiest stage to find) on the asters, the aster hosts should be identified, each family should be reared (perhaps by splitting the larvae into two groups and using a different photoperiod regime on each group to determine the effect of photoperiod on phenotype), notes on larval nests should be made (and leaves with nests can be preserved in envelopes) and photos should be made of larvae and pupae and a few should be pickled, and the resulting adults should then be examined for antenna/wing phenotype and then tested using electrophoresis and DNA analysis. The results would surely determine whether the two taxa are reproductively isolated at that locality.

**NUMBER OF GENERATIONS.** The number of *diminutor* caught in south-central Minnesota (Freeborn Co.), lumping data from from 1985-2005 (I was there almost every year), was as follows: June 10 (3m1f), June 11 (74m18f), June 12 (1m), June 16 (4m2f), June 19 (11m5f), June 20 (63m23f), June 22 (1m1f), June 24 (2m), June 23 (10m2f), June 25 (1m), June 29 (*diminutor*?) (1m), July 13 (Renville Co. Minn.) (1m), July 27 (4m), Aug. 13 (2m4f), Aug. 15 (1m1f), Aug. 16 (1m1f), Sept. 12 (egg cluster reared), Sept. 13 (7m13f). Considering that I usually went there in June (10 visits), and seldom in May (4 visits), July (3 visits, and 1 to nearby Renville Co.), Aug. (1 visit), & Sept. (2 visits), these records suggest that the first generation flies mid to late June and adults become worn in late June, there is a second (weak or partial?) generation in mid to late July perhaps to mid August, and the last generation flies mid September, or mid Aug. to mid Sept. However, the July generation is possibly weak or just occasional, because the July 27 1999 record was next to woods so perhaps the larvae grew under trees and emerged later?, the July 13 1986 record was just one worn male next to the Minnesota River (where flights may be later?), and in the two other years that I visited in July (1997 & 2004) I saw no *diminutor* (but only one *tharos* was seen in July 1997). But it was found in mid Aug. Oddly, I did not find *diminutor* there after 1999 until it reappeared in 2005; it fluctuates greatly in abundance from year to year and was only very common in 1995 & 1996, and was not seen in some other years such as 1987, so its appearance is irregular. Anyway, there are two or three generations in Freeborn Co. Minn.

*P. tharos* in Freeborn Co. Minn. evidently has the same three generations, though the first generation seems to fly a bit earlier on average (early to late June). The second *tharos* gen. in July also may be weak, as I only caught 4 on July 25-30 1999, only 7 on July 23-28 2004, only 2 worn ones July 8-13 1997, and only one July 13 1986. But I caught many in Aug. 2005 (4m Aug. 13, 8m3f Aug. 15, 1m7f Aug. 16), which might be part of the 2<sup>nd</sup> gen. It was fairly common in Sept. both years, so that is a full generation, in mid-late Sept. at least.

So, maybe the second July "generation" is weak in both *diminutor* and *tharos* in S Minn.

**EARLY STAGES** (3 mi. NE Alden, Freeborn Co. Minn., Aug. 16, 2005, cluster of 172 eggs laid in lab. Mother had black nudum with narrow orange steps [a line on each step], with tawny at edge of club, the upf dark with paler creamier median band, uph with strong line across central space, unh a large russet-brown patch, so I thought it was *tharos*. But the offspring were *diminutor*, as the mature larva ground color and pupal color were like *diminutor* not *tharos*, and the offspring males had orange nudum and large uph orange central space, even though the females mostly had brown nudum! and a black line across uph space!). EGG pale-green, in cluster of ~119 eggs on lower level and 53 on upper level=172, laid Aug. 18, hatched Aug. 23-24, duration 5 days. 1<sup>ST</sup> STAGE LARVA cream with green innards, head & collar chitin, no other markings; a little silk web sun on oviposition leaf, none on feeding leaf, after 4 days the molting larvae have the subdorsal chitinous plates (evidently scoli beneath) darker, molted Aug. 27-28, duration 4-5 days. 2<sup>ND</sup> STAGE LARVA creamy-tan with green innards, a middorsal brown line, a brown line below that, creamy subdorsal band with scoli, a broad brown band with scoli, a weak dark line along upper side of BL1 scoli, BL1 scoli creamy in a pale band, scoli pale except upper scoli light-brown (BL1 scoli creamy), head & collar chitin colored. No silk spun on leaves. Molted Aug. 29-31. 3<sup>RD</sup> STAGE LARVA dark-brown with usual pattern, scoli brown, BL scoli cream-tan, the subdorsal cream band 2/3 complete to 90% complete, scolus tips cream; head with cream circle on frontoclypeus and the usual vertex stripe. MATURE LARVA ground color dark-brown (not blackish, thought the darkest larva was blackish-brown), ground color about the same above as below the subdorsal cream band, the subdorsal cream band is 60% (2/3 to 3/4 complete), base of BD1 scolus brown or orangish-brown (brown on darkest larva), the tawny area in front of and behind BD2 scoli is orangish or brownish-orange (orangish on darkest larva), brown near BSD scoli in all larvae, the ring around BL1 scoli is orangish-brown even in dark larva; scoli black, except BL1 scoli orangish-tan (creamier on T1-2), scoli have a tiny cream tip; head black with the usual subdorsal cream stripe and the usual cream patch (circular with dorsal protrusion) on frontoclypeus; 50% had pupated by Sept. 15, on Sept. 18 nearly all had pupated in lab, on Sept. 20 only one healthy mature larva remained. PUPA usually (60%) ochre-tan, many (40%) grayish-cream, wing case has moderate to sometimes strong mottling (the stronger-mottled individuals have more blackish on T1-A3 also). Adults emerged Sept. 21-28 (most Sept. 23-24), females emerge an average of 2.1 days later than males in lab.

## 6B. *PHYCIODES DIMINUTOR* (OR *P. COCYTA?*) *INCognitus* GATRELLE 2004

This taxon was described and illustrated by Gatrell (2004) from five sites at altitude 2200-4000' in the Appalachians of western N.C. and northeastern Georgia, in openings in hardwood forest, flying in two generations (May-June, and late July-mid Aug. with stragglers through Sept., sympatric with *P. tharos* which flies from late April until frost in evidently three or more generations there. It has evidently introgressed with *P. tharos* to the extent that its mitochondrial DNA is the same as local *P. tharos* (just as the mtDNA of S Appalachian *Papilio [glaucus group] appalachiensis* is the same as local *P. glaucus* evidently due to introgression). It clearly is a member of the *P. cocyta* group (not *tharos*), and is some kind of variety of *P. cocyta/diminutor*. Its antenna club is orange and elliptical like *P. cocyta/diminutor*. The uph black line frequently crosses the large uph orange space on Gatrell's photos, but Gatrell (pers. comm.) tells me that "*incognitus* males do usually have large DHW patch like *diminutor* and *cocyta*", and my one male specimen has a large space (no line in 3 cells). The upf is described as being a little more two-toned (the postmedian band a bit paler) than *cocyta* (though mine is not). Like *cocyta*, the unh averages a bit warmer in color and the marginal brown patch seems to be mostly wider and paler than most *tharos*, the included crescent varying like *tharos* from absent to present. The larval color and pupa color and bump size resemble *cocyta*. The *incognitus* has two generations, like *diminutor*, but is larger than *diminutor*, so I will provisionally treat it as at least a valid ssp., being a *cocyta*-like critter that is bivoltine and large in size. The older larval head is stated to be higher than wide, though confirmation is necessary because such a difference in head shape seems extremely doubtful to me (I have not seen any larvae, but the head photos in Gatrell 2004 that look higher—figs. 1-2—are fuzzy, while the heads on the clear photos—figs. 5 and 6 left—look the same as *tharos*.) (I am told that Gatrell's collection when he died contained no immatures at all, thus unfortunately he saved no head capsules that could confirm this shape). The *diminutor* also has two generations, so *incognitus* might be a ssp. of *P. diminutor*, if both these taxa are a different species from *P. cocyta* (it is still somewhat uncertain whether *diminutor* is a separate species from *cocyta*, as noted above). A good study of the status of *incognitus* would include searching for egg and young larva clusters on the plants in nature, and then rearing several dozen of these clusters, and noting the silk nest and larval pupal and adult traits; that study would surely determine how many species are there. The status of some of these names in eastern U.S. needs a lot more study.

David M. Wright (pers. comm.), states that there is a large, orange-antenna, bivoltine critter in the Pocono Mts. of NE Penn. (Monroe, Pike, and Wayne Cos.), which may be referable to *incognitus*. Gatrell (2004) suggests that specimens from the Allegheny Mts. of Elk Co. Penn. (figured in the book Butterflies of Ohio) may be *incognitus*. So maybe *incognitus* ranges from NE Penn. to NE Ga.

Some detailed comments on Gatrell (2004)'s paper: On p. 4, the *orantain* TL is Barr Lake not Bear Lake, Sydney is on Cape Breton I. not Cape Britain, and the fig. 37 specimen from Sydney is 15 miles from the *cocyta* TL at Black Rock so is not precisely a topotype. Kanawha is misspelled several places such as p. 6 & 7 middle & 7 bottom. P. 6 bottom, the mtDNA is so variable that identifying the Greenbrier Co. specimen as *cocyta* would be dubious. P. 16, *cocyta* from Ont. and Colo. clustered with *tharos* in group B of Wahlberg et al. (2003), again suggesting that one cannot identify the species from its mtDNA. P. 17 top, the valva figs. I & J are upside down. P. 17, *cocyta* actually flies in the first half of summer. The name *incognitus* isn't the best, because most *Phyciodes* are difficult to identify, thus the name *incognitus* does not describe any of the taxon's unique features; but the name must be used because it satisfies ICZN requirements.

It was easy for Gatrell (2004) to criticize the identifications of specimens in Wahlberg et al. (2003) (most identifications were by me), but those specimens were illustrated on Wahlberg's website where a number of other butterfly people also checked their identification. And Gatrell's logic--that variable DNA was an artifact of misidentification--fails to explain why *P. pulchella* and the *P. phaon* group also have such variable mtDNA. Actually, I admit that I cannot identify some wild-caught adults in the *Phyciodes tharos* group, esp. females (such as the samples in Wahlberg et al. 2003 labeled "*batesii* or *cocyta*" from Alberta; Wahlberg thinks that the females from Alberta labeled "*batesii* or *cocyta*" are most likely *P. cocyta* based on their mtDNA), but the large variation of mtDNA found by Wahlberg et al. was definitely not an artifact of misidentification. And I question how Gatrell (2004) can confidently identify FOUR species (*marcia*, *diminutor*, *incognitus*, and *tharos*) out of Edwards' Carnegie Museum specimens from Coalburgh, W.Va., and I suggest that the identifications of *diminutor* and *incognitus* from there are extremely dubious, and are just variants of *marcia* (the thought that anyone can look at these "steno-species" bugs and confidently identify every one as four species is so preposterous as to be quite funny). Gatrell states that *incognitus* occurs at Coalburgh W.Va., but the specimen he identifies from there (color photo at the "News, Oct. 2004" part of the [www.tils-ttr.org](http://www.tils-ttr.org) website, which from photo and Gatrell pers. comm. is a male with orange nudum, elongate club, 1 ½" wingspan, the black postmedian line extending across wing but weak in two uph cells, upf median band paler, a cream crescent in unh marginal brown patch) looks to me like it could be *incognitus* or just a large *marcia* or *diminutor*, as *Phyciodes* are so variable. He states that *diminutor* occurs at Coalburgh also, but those few specimens could just be small *marcia*; I have seen too much variation in these *Phyciodes* to be confident of identifying single wild-caught specimens. Allen (1997) and Paul Opler state that *P. cocyta* in W.Va. is univoltine, unlike *diminutor* and *incognitus* which have two generations, so if we use this single character to assign species (a dubious procedure) we can place *marcia* into *P. cocyta* as Gatrell did, and place the N.C.-Georgia populations into *P. diminutor incognitus*.

Niklas Wahlberg has sequenced the mtDNA of seven *incognitus* by now, and they all cluster within the large *tharos* cluster and are like local S Appalachian *tharos*, which suggests to him that they are just *tharos*. He suggests that perhaps temperature/photoperiod may influence the phenotype to produce *incognitus*. Such experiments are worth pursuing (one should divide egg or larval clusters and rear them in different environments). Charles Oliver claimed that photoperiod did affect the phenotype of these butterflies. Oliver (1976) found that short photoperiod rather than temperature causes the melanic unh spring form *marcia*, although Edwards seemed to show cold could also produce *marcia* (it has been obvious for decades that the spring form *marcia* with its browner white-spotted unh is an environmental form). We don't know the full extent of environmental influence. I reared my *Phyciodes* in my basement with artificial light, and I have just assumed that the differences I found were just genetic ones, as the variation I found was like what I saw in nature. However, I can say now that it would be extremely surprising if the differences that we find in antenna club color, club shape, wing size, uph black line strength, pupa color & shape, number of generations (and doubtfully larval head shape), were all simultaneously due to temperature/photoperiod. Gatrell raised *incognitus* and *tharos* simultaneously in the same house conditions, and still got the regular differences. And Gatrell notes that *incognitus* has been found at just four sites, and at a range of altitude 2000-4000', and the phenotype is similar in two generations months apart, which does not fit the environmental theory.

**EARLY STAGES** (extracted from Gatrell 2004). Early stages all seem consistent with *P. cocyta*. **EGG** pale-greenish when laid. **1<sup>ST</sup>-STAGE LARVA** (Gatrell fig. 15) resembles *cocyta* & *tharos*. **MATURE LARVA** (Gatrell figs. 10, 14) dark-brown (not blackish), with the usual pattern of *cocyta*, orange-brown beside BD2 scoli, brownish-orange around BL1 scoli, scolus tips cream; head black with the usual *cocyta/tharos* pattern, white areas large, frontoclypeus mostly cream as in local *tharos*; head height supposedly higher than wide (dubious, I think head shape is the same as *cocyta/tharos* because the two figs.—figs. 1-2—that seem to show greater height are out of focus, and the head appears normal in shape in figs 5 & 6 left). **PUPA** (Gatrell figs. N, O, Pa, Pb): most pupae creamy-tan (fig. O), some brownish (figs. Pa, Pb), some blackish-gray (fig. N) (in contrast, local *tharos* were nearly all brownish-tan [figs. Ma, Mb], and in *tharos* creamy-tan pupae were uncommon, and blackish-gray pupae [fig. L] rare); cones on thorax a little smaller than *tharos*. Duration egg-adult averaged 35 days (maximum 50) at 75-78°F.

## 7A. *PHYCIODES BATESII BATESII* (REAKIRT) 1865

**SYNONYM** *maconensis*. Gatrell (1998) named "*maconensis*" as a subspecies from western North Carolina and northeastern Georgia, characterized by its usual absence of an unh marginal brown patch. Adults were figured by Scott (1994, figs. 133-136). This "*maconensis*" is an obvious synonym of *P. batesii batesii*, because *P. batesii batesii* is already known to have a predominant lack of an unh marginal brown patch, "*maconensis*" is the same in other characters (hostplant, larval frontoclypeus, etc.), "*maconensis*" matches perfectly the original description of *batesii*, and because I think that any cline must have at most two--not three--names.

It is completely obvious to reasonable taxonomists that a cline should have at most only two names (one for each end of the cline). In fact, some scientists think a cline should have only one name. Mayr (1969) states, "Indeed, when the geographic variation of a species is clinal, it is usually inadvisable to recognize subspecies, except possibly for the two opposite ends of the cline when they are very different or separated by a pronounced step." Now Gatrell (1998) has regrettably named three names for the cline. If we accept three names in a cline, why not four or even five names, where do we draw the line? This cline makes no sense to have more than two names. When there is a cline, and the type localities of the names are at 0% and 80% of the distances from one end of the cline to the other, as *lakota* and *batesii* are in the cline of large brown unh marginal patch varying to no patch (and *batesii batesii* is 100% at the end of the variation in hostplant and frontoclypeus traits), then the latter name should be interpreted to represent the 100% end of the cline also. Obviously, we cannot treat *batesii* as a synonym of "*maconensis*", in order to place two names at the 0% and 100% ends of the cline, because *batesii* is the older name. And *lakota* is quite different from *batesii* in multiple traits, so we cannot place *batesii* on the western end of the cline (as Gatrell tries to do) and "*maconensis*" on the eastern end. Obviously Gatrell's use of three names for one cline cannot continue!, and the only solution is to eliminate one name, "*maconensis*", by placing it in the synonymy of *batesii* where it belongs.

Gatrell (1998) complained that my paper (Scott 1994) was biased, and called me "prejudicially incorrect", but I was only doing my proper duty as a taxonomist, to make sure that the names properly show the variation that exists in nature (one cline with two names). I did what I had to do to ensure that there are only two names for one cline. Scientifically correct taxonomy is not prejudice. But three names for one cline is bad science. The taxonomist's duty is to manipulate the malleable items at his disposal (select type localities, designate lectotypes/neotypes, make first-reviser actions, etc.) to ensure that the chosen names best fit the situation found in nature.

The second great flaw with Gatrell's (1998) paper, is his assumption that the characteristics of a single syntype specimen (the Winchester syntype) has any great bearing on the characteristics of the population or its subspecies. A subspecies name is valid even if one of the types--even the holotype--looks like another ssp., if the population itself is predominantly unlike that second ssp. Mayr (1969, p. 190) wrote "A so-called 75-percent rule is widely adopted.", such that most (75%) individuals of one ssp. must differ from most individuals of the second ssp. for the two ssp. to be valid.

But the exact percentage is not formalized in the ICZN Code. In other words, the type specimen could be atypical, and yet the ssp. could still be valid, if the characteristics of the population differ. The type can be aberrant, or can be a leg, a fossil shell, or a cast skin, and yet the ssp. may still be valid. The holotype (and any other type) is good ONLY for designating the POPULATION whose characteristics are to be compared to other taxa, and it is those population characteristics, rather than the atypical or typical type, that are to be used for determining the validity of the taxon. Thus, even though the Winchester specimen has a brown patch, that does not make it a separate ssp. from N.C. populations, because everything that is known about *P. batesii* in the Appalachians indicates that its POPULATION had a preponderance of individuals without the unh brown patch. How do we know that? Because all the populations from southern Ontario to N.C. have a majority of individuals lacking the patch. W. T. M. Forbes and A. B. Klots etc. all wrote, and Clark & Clark (1951, for Virginia) and Shapiro (1966) and Thomas Allen (1997) and others illustrated, that *batesii* typically has no brown unh patch, because those authors looked at available specimens and saw that most *batesii* in that area had no patch. Even in central New York, most adults substantially lack the patch (4 lack it completely, 5 have a one-lunule tiny remnant of a patch, 6 have a two-thirds-size or full-size patch), while northward near Ottawa Canada the patch varies from absent to full (Scott 1998). Gatrell's methods are contrary to proper systematic practice, because he used extremes of variation rather than averages to attempt to justify naming a third name in the cline (he used dark-patch individuals from the central Appalachians and central New York to claim that they differ from southern Appalachian adults, and failed to emphasize the patchless adults from there and the N.C. females that have a slight patch [and note that Scott's {1994} figure 133 of a N.C. male and his figure 136 of a N.C. female had some brown patch color on unh margin]), then he erroneously claimed that "this patch in *lakota* isn't consistently prominent (Fig. 16)." even though his fig. 16 photo does have a conspicuous brown unh patch (and see the *lakota* figs. 137-148, 173-175 of Scott 1994)! Gatrell picked out the palest individuals from Nebraska and compared them with the darkest-patch specimens from the east, and erroneously claimed that *lakota* is a synonym of *batesii*. Gatrell (p. 3) miswrote that I lumped Edmonton *P. batesii lakota* into "eastern *batesii*", even though I clearly stated otherwise and I even listed on p. 56 in huge black letters "P. batesii lakota Alberta variety"! Gatrell's bias of only considering extremes of variation to justify splitting and lumping cannot be accepted.

Reakirt's original description of *batesii* (based on multiple specimens, at least three males and at least one female, counting specimens mentioned in text and the syntypes) did not mention any unh brown patch: the unh was described as "ochrey-yellow" with pale-fulvous lunules near the outer margin, and rarely one of these lunules is bright ferruginous. That original description applies perfectly to "*maconensis*"!

Clearly Gatrell has not examined sufficient specimens of *P. batesii* from outside the southern Appalachians to understand the average characteristics of populations from those outside regions. Gatrell's suggestion that *P. batesii batesii* and *P. batesii lakota* are synonymous because they both have the unh brown marginal patch is erroneous, because their average characteristics differ greatly (in patch size, frontoclypeus, hostplant type, etc.). The weakest-patch *P. batesii lakota* family mentioned by Scott (1994, top of p. 51) that Gatrell cited as "in wing pattern resembles N Appalachians [=*batesii batesii*] adults", actually does not have an unh patch like *batesii batesii*, the family had a "pale-brown patch that was narrow in males and limited to the margin" (top line of p. 51), but was wide in females, and nearly all of the many families reared from there had a rather large brown patch (a "family" is all the offspring from an egg cluster laid by one mother).

Gatrell suggests that geographic isolation by not being able to cross lower-altitude valleys contributed to the subspecies difference of "*maconensis*". But the butterfly may have occurred in southern Appalachian valleys prior to development, when hordes of people wiped out the habitat at lower altitudes (the Georgia sawmill site at the head of the Coleman River was perhaps in a valley). And *batesii* may still occur on ridgetops in many places in Virginia and Pennsylvania, as it was found on Apple Orchard Mtn. at 3200 feet altitude in Bedford Co. in Virginia (equivalent to the 4000 feet altitude in N.C.), and on Beanfield Mountain and Mountain Lake in Giles Co. Virginia, and was recorded as rare by William Henry Edwards from the Cumberland Mts. at Coalburgh West Virginia. The syntype from Winchester Va. (type locality of *batesii*) could have been taken in the high mountains to the west (such as Pinnacle 2870'?), considering that collectors did not put exact localities on butterfly specimens in the 1860s and another *batesii* syntype was mislabeled "Colorado" (the "Colorado" syntype of *batesii* [Fig. 15 of Gatrell] is obviously mislabeled [valid Colorado *batesii* are all the very orange *P. b. anasazi*, which looks more like *P. cocyta* than *P. batesii batesii*] and is presumably from Va.-Penn. or vicinity, but note that it has very little unh marginal brown). Even today, *batesii* could still occur on the higher mountains of Virginia-West Virginia and Pennsylvania. Actually, most lowland records of *batesii* seem to be errors: Shapiro's Delaware Valley "*batesii*" are mostly based on specimens now missing or actually represent misidentified *P. cocyta* (David M. Wright, pers. comm.), however Wright states that there is one voucher specimen of *batesii* from Philadelphia that he knows of. Paul Opler examined eastern museum specimens and states (pers. comm.) that he does not believe *batesii* ever occurred in the Philadelphia area, although Wright has evidently seen the one specimen. N.J. records are dubious, and even the Gloucester N.J. *batesii* syntype has disappeared (perhaps because it was really *P. cocyta* and has been sorted into series of some *cocyta* or *tharos* in a museum?). But Wright suggests that "I imagine that this species [*batesii*] did occur in Reakirt's time in Gloucester N.J., in the 1860s. That city is immediately across the Delaware River from Philadelphia, not more than 1-2 miles from Philly. Although technically in the Coastal Plain, it [Gloucester] is in the outer part of the Outer Coastal Plain.

The vegetation there is distinctly Piedmont in character.” So probably *batesii* did occur there before the area was developed. But considering those mountain records in Virginia and vicinity, and the paucity of valid records from lowland areas, there is really no evidence that the habitat of “*maconensis*” is significantly different from the habitat of Va.-Penn. *batesii*. Scott (1994, 1998) and Catling (1998) described the *batesii batesii* habitat as basically savannah, just like the open hardwoods habitat of “*maconensis*”. Reakirt’s original description of *batesii* did not mention the coastal plain or piedmont or Upper Austral or any other clue as to its habitat. Higgins’ (1981) *Phyciodes* revision figured a *P. batesii batesii* (without a brown unh patch, just a bit of brown along the margin) from Scranton, Pennsylvania, but near there are several peaks 2200’ and 2693’ in the Moosic Mts.. Wright tells me that “The Scranton material (as far as we can tell) all came from local collector Max Rothke, who collected & traded extensively from about 1900-1925. His favorite haunts were the Moosic Mtns. near Scranton in Lackawanna Co., particularly the valleys created by dissecting streams (Spring Brook Valley). It was there he collected many interesting species, including our only record of *Chlosyne gorgone*.” So that Scranton specimen was evidently not from a lowland locality.

*P. b. lakota* in the Pine Ridge of Neb. is actually isolated from populations in the Black Hills, and Black Hills *lakota* is isolated from populations in North Dakota, by far more distance than “*maconensis*” might have been isolated from other possible historical populations (if “*maconensis*” was ever isolated at all—the current isolation is due largely to human devastation of the landscape, plus overgrowth of forest due to fire suppression that chokes out the semi-open habitats preferred by *P. batesii*). *P. batesii lakota* occurs everywhere in the Transition Zone to Montane Zone, from the Black Hills of South Dakota north to the Northwest Territories and the edge of the Hudsonian Zone in northern Manitoba, and even its type locality the Pine Ridge of Nebraska is a Transition Zone ridge of Ponderosa Pine--the most montane area of Nebraska--where *lakota* only occurs on the cool north slopes. Thus Gatrell erroneously claimed that the montane habitat of “*maconensis*” contrasts with the non-montane Upper Austral Zone habitat of *P. b. batesii* and *P. b. lakota*. Actually, 4000 feet in N.C. is equivalent in life zone to the lowlands in the northern part of the range of *P. batesii batesii*. Of course, even if two populations do occur in two different life zones, that does not mean they are different subspecies!

Gatrell mentioned Shapiro’s Wissahickom “virtual topotype” (how can it be a “virtual topotype”—a terminology not mentioned in the ICZN Code--when it is 15 miles away from a Gloucester locality that in turn is not the type locality?), but failed to figure it; it must have a rather weak patch, if it has only “quite a bit of shading along ventral margin”. The Wissahickom specimen may match some N.C. *batesii*, some of which (females) have a small brown patch along the unh margin (which Gatrell did not illustrate). Perhaps this specimen is actually *P. cocyta* (which usually has a large brown patch) like Shapiro’s other “*batesii*” from N.J., because many or all of Shapiro’s Delaware Valley “*batesii*”, as noted above, are actually *P. cocyta*. I have not seen a valid N.J. *P. batesii*, but I have not looked at the big museum collections.

The zeal to name new taxa is useful in providing motivation and recognition for unpaid lepidopterists to do taxonomic research. But zeal is not enough to make a name valid, when that name *maconensis* is applied to a population that perfectly fits the original description of *batesii*.

There are 200 names for subspecies of *Parnassius apollo* in Europe, making European lepidopterists the laughingstock of systematists worldwide. If we continue splitting U.S. subspecies unreasonably, including naming three ssp. for each cline, we are headed for the same fate. Perhaps nothing can stop the relentless splitting. Even if most lepidopterists refrain from splitting some taxa, another person can later split the same taxa into more ssp.. Soon all the localities have their own ssp., and most of the species end up in their own genus. (And the idiot morons in our government Endangered Species Office then treat these worthless subspecies the same as valid species, and because of their small ranges designate them as endangered or threatened.) The more prudent taxonomists will then have to lump the excess, but some people will continue to use the names merely out of ignorance or inertia. Thus the checklists relentlessly grow larger. And many people give up on scientific names and use common names instead.

**MISIDENTIFICATIONS.** Glassberg (1999) switched photos 9 & 10 of female *P. batesii* and *P. cocyta* on his plate 32, as noted above.

**DISTRIBUTION.** *P. batesii batesii* has now been found at several sites in Clay Co. N.C. by Ronald R. Gatrell.

## 7B. *PHYCIODES BATESII LAKOTA* SCOTT 1994

**RANGE:** The Alberta-Manitoba butterflies that I formerly lumped into this ssp. have been removed to ssp. *saskatchewan*, which is named next. So ssp. *lakota* now occurs only in W Neb. and South Dakota (and perhaps North Dakota, and probably Minn.), east to Wisconsin & Michigan & C Ontario east to the E margin of Lake Huron.

## 7C. *PHYCIODES BATESII SASKATCHEWAN*, NEW SUBSPECIES

**DEFINITION:** resembles *P. batesii lakota* Scott in having a good-sized brown marginal unh patch, but the unf black spots (all three main spots, most noticeably the posterior two) are smaller. This is the “Alberta variety with slightly orangish ups and slightly smaller unf spots” of Scott (1994). It seems worth naming because it is rather distinctive and fairly constant, and the smaller black spots make it more likely to be confused with *P. tharos*. The antenna nudum is generally black, greatly aiding identification, but rarely orange as in S Alberta *P. tharos orantain* Scott. I examined 11 males 3 females from 30 km N Lac La Biche town, Alberta, and found that one male has the nudum fairly dark but mostly orange,

and one female that has the nudum orange-brown. This male is oranger in general, as the wing uns are oranger, the postmedian-subapical triangular spot on unf costal margin is orange-brown (not containing a black area as is characteristic of *batesii/tharos/cocyta*), and the black unf spots are reduced in size also. The others from this site are ordinary *P. b. saskatchewan*, and ordinary *P. cocyta* also occurs there. So, we now know that the antenna nudum is rarely orange in this ssp. (the nudum is always black in ssp. *lakota* as far as known). **TL AND HOLOTYPE** male (BMNH)(fig. in color on plate V by Scott et al. [2006], and in b/w by Scott [1994] fig. 175) and 11 male paratypes (figs. 173-4, 176-7 of Scott [1994]) Halfway Lake (N of Edmonton near Clyde) Alberta, July 4, 1989, coll. Norbert G. Kondla; 10 male 1 female paratypes 30 km N Lac la Biche town, N of Edmonton, July 5, 2002, coll. B. Chris Schmidt. **RANGE:** Alberta, and also Manitoba as my series from S Man. (Onanole, Anola, Sandilands) and C Man. (The Pas) also have small black spots, as does a male from Riding Mtn. NP Man. June 28, 1966 John S. Nordin (Gillette Museum, CSU) and the figs. from Man. in Klassen et al. (1989); the fig. from Sask. in Hooper (1973) also has small black spots; probably the whole NW portion of the range to NWT is ssp. *saskatchewan*. Michigan *P. b. lakota* have larger black spots, as does Neb. *P. b. lakota*, many of which also have the unf tornal black spot enlarged as well. **NAME:** The Saskatchewan River runs from C Alberta (near the TL) to the middle of Man. (right past The Pas), so is somewhat appropriate, and the bug occurs in Sask. as well.

### 7E. *PHYCIODES BATESII ANASAZI* SCOTT 1994

**STATUS.** Warren (2005) suggests that *anasazi* is a ssp. of *P. cocyta*. That is incorrect; *anasazi* actually is a set of populations of *P. batesii apsaalooke* that has introgressed with *P. cocyta*, and thus has come to resemble *cocyta*, especially at the highest altitudes where it ranges near *cocyta*. At low altitude, *anasazi* looks much more different from *cocyta*. Just by counting the number of characters of *anasazi*, we know that it is closer to *apsaalooke* than to *cocyta*, and in its habitat (occurring on sliding dirt next to a gulch bottom or creek, versus aspeny glades in *cocyta*) and hostplant (*Aster glaucodes*) it belongs to *apsaalooke*, not *cocyta*. One must look at all characters, and look at the whole range, to properly assign species status. It is obviously related to *apsaalooke*, from the Bighorn Mts. Wyo., and *P. cocyta selenis* (and *P. tharos* and *P. pulchella*) occurs also in the Bighorn Mts. (in moist valleys with *Aster laevis*), so *apsaalooke* can hardly be a ssp. of *P. cocyta*, and since *anasazi* is a close relative of *apsaalooke*, *anasazi* can hardly be a ssp. of *P. cocyta* either. These *Phyciodes* are stenohspecies, which introgress and hybridize for reasons we don't understand, and they don't fit into ideal species pigeonholes. *P. cocyta selenis* has been caught in the middle of the Colo. *anasazi* range at No Name Creek, ~7500', Glenwood Canyon, Garfield Co. Colo., June 17, 1978 (Ray E. Stanford, 4 males in Gillette Museum, Colorado State Univ.=CSU.), and at Grizzly Creek in Glenwood Can. (by Scott, with *anasazi*).

**RANGE.** More records: Pitkin Co. 7 Road, 2-3 mi. SSE Emma, 7500', Pitkin Co. Colo., June 12, 1997 Michael S. Fisher 1m1f; Sixmile Crk., 6250', 3.5 rm ENE Sterling, Sanpete Co. Utah, July 19, 1996 Ray E. Stanford 1f(CSU); near Basalt, Eagle Co. Colo. 4m4f(CSU); U.S. hwy 191, 7100', 5.5 rm NE U.S. 6, Carbon Co. Utah, June 22, 1996 R. E. Stanford 1m1f (CSU); Rilda Can., FR 246, 7700-7950', 1-3 rm WSW Utah 31, Emery Co., Utah, July 21, 1996, R. E. Stanford, 2m (CSU); I-70 at mp66, 13 rm ESE Salina, 6600', Sevier Co. Utah, July 17, 1996 R. E. Stanford (CSU); near U.S. hwy 191, 6600', 3.3 mi. NE Castle Gate, Carbon Co. Utah, June 12, 1986, R. E. Stanford 1f (CSU); near Basalt, Eagle Co. Colo., 4m4f (CSU); Big Wash, 5100', off base of DeBeque Can. 7.5 mi. up hwy 65 from I-70, Mesa Co. Colo., Paul A. Opler 4m6f (extremelly orange, upf pm band very pale)(CSU); Uncompahgre Plateau, Montrose Co., July 27, 1975, Donald Bowman, 2f (CSU); JQS trail/road, 6000', Roan Cliffs, Garfield Co. Colo., 1f (CSU); E fork Parachute Creek, 7000', Roan Plateau, Garfield Co. Colo., M. B. Wunder, 1m1f (CSU); Mesa Verde Nat. Park, Montezuma Co.? Colo., Paul R. Franke, June 30 1929 1f, July 25 1930 1f(CSU). A female from Shadow Lake Dam, Ranger Meadow, ~8300', Rocky Mtn. Nat. Park, is labeled *anasazi* in CSU coll., because it has a cream postmedian upf band, but 4m1f from there look like just *P. cocyta*, so I assume the specimen is just an individual variant of *cocyta*, as *Phyciodes* are so variable (in Jefferson Co. Colo. I have found numerous strange-looking *P. cocyta*). To properly identify these bugs, one should really rear a family of them, or at least one should find a number of them with the proper wing characters closely assoc. with *Aster glaucodes*.

Paul Opler (pers. comm.) thinks that adult *P. batesii* from SW Utah and N Arizona are darker than ssp. *anasazi*. I have only seen a few adults from each area, and the Utah ones I have seen are oranger than *apsaalooke*, but the 2 males I have seen from a canyon in the Kaibab Plateau Arizona were darker than most *anasazi* and somewhat similar to *apsaalooke*, and the Grand Canyon specimen in AMNH perhaps is dark also as it was identified as "batesii". If the Ariz. adults are mostly darker and resemble *apsaalooke*, we should use the name *apsaalooke* for them, and limit the name *anasazi* to that area of W Colorado and evidently Utah where adults are oranger evidently from introgression with *P. cocyta*. However, the Gillette Museum has 1m2f from Oak Creek Can. Ariz. (S of Flagstaff) that are evidently *anasazi* (rather than *cocyta*) and are small and very orange, which suggests that *apsaalooke* does not occur in Ariz. And the 2 males from the Kaibab Plateau canyon noted above were still a little oranger than *apsaalooke*, so I don't think the name *apsaalooke* is applicable even to those populations. Arizona *Phyciodes* need more study. We also need to rear the White Mts. Ariz. butterflies to make sure they are *P. cocyta* and not *P. batesii*, although I assume now that they are *cocyta* because *Aster glaucodes* is not recorded from the White Mts., so *P. cocyta* probably occurs there, but the identification should be confirmed.

## 8. *PHYCIODES PULCHELLA* (Bdv.) 1852

**DEFINITION & IDENTIFICATION:** The fw costa appears to average a little straighter in this species, on the average, which may help separate it from *P. tharos*/*P. cocyta*/*P. batesii*, although this trait is variable. Actually, all the *Phyciodes* (*mylitta* group, *phaon* group, and *P. pulchella*) have this straighter fw costa, except *P. tharos*/*P. cocyta*/*P. batesii* which have a slightly more curved fw costa.

An additional character, the color of the uph median band, has been added to Table 4. This band is generally yellower than the postmedian band in *pulchella*, whereas it is orange in the other *Phyciodes* species. In *P. p. montana*, this band is oranger esp. in females, but these females generally have the band yellowish at the rear, a nice identification feature.

**NOMENCLATURE.** Layberry, Hall, & Lafontaine (1998) wrongly used the name *pratensis* (Behr) for this species. They erroneously claimed that the name *pulchella* lacked a description, when actually Boisduval's description of the range of *pulchella* and Boisduval's positive comparison of *pulchella* with one species and his negative comparison of *pulchella* with another species did constitute a description—a bad description, but a description nonetheless. Also, there were no ICZN rules in Boisduval's time, so technically a description was not needed then anyway. They erroneously claimed that *pulchella* was proposed by Boisduval to be applied to an illustration of *Phyciodes tharos* in Drury (1773), when actually the name *tharos* did not appear at all in Drury (1773) (the name *tharos* only appeared years later in another publication) and the illustration does not represent *tharos* and is identical to California *campestris* (only by forcing the concept of *tharos* to preserve stability of the name *tharos*, and declaring a *tharos* neotype, did Scott 1994 retain the name *tharos* despite the fact that the illustration does not look like *tharos*). The latest version of the ICZN code 72.5.6 states that the name-bearing type (present in the Smithsonian now) is the specimen on which to base the name, not the illustration. Thus the name *pulchella*, not *pratensis*, must be used for this species; Boisduval named the species—*pulchella=pratensis*—that looks like that illustration. This situation was carefully explained by Scott (1994, 1998). Layberry et al. (1998) assume that the current method of citation of authors of scientific names has remained unchanged for 150 years, when actually our current method of citation has been used for little more than half that time. Currently, when someone writes *Vanessa cardui* Linnaeus we immediately assume that Linnaeus formally named *cardui*; but Boisduval would write *Vanessa cardui* Kirby, *Vanessa cardui* Fabricius, and *Vanessa cardui* Harris, and Boisduval meant only that Kirby, Fabricius, and Harris wrote three **papers** in which *Vanessa cardui* was mentioned, Boisduval did NOT mean that Kirby, Fabricius, or Harris originally named *cardui*. Even when Boisduval wrote *Vanessa cardui* Linnaeus, he was not writing that Linnaeus named *cardui*. Trying to activate a time machine to return back in history to apply today's 500 pages of legalistic rules of nomenclature to people 150 years ago, as Layberry et al. attempted, is ridiculous. Boisduval did not mean, when he wrote “Pap. Tharos. Drury, Ins. I. pl. 21, f.5,6”, that *pulchella* was a synonym of *Pap. tharos* Drury.

Kondla & Guppy (2002) published an additional note proving that *pulchella* is the correct name (and not *pratensis*), because Boisduval's citation of “Drury, Ins. I. Pl. 21, f.5,6” is an “indication” in the meaning of the ICZN Code (1999, Article 12.2.7), an indication being “the proposal of a new...species-group name in association with an illustration of the taxon being named, or with a bibliographic reference to such an illustration...” They note also that the name-bearing type of a taxon is the museum specimen and not an illustration.

**The writer of the “a/c Hofer” labels on Boisduval specimens: Foster Hendrickson Benjamin.** Conclusive proof is now available that all the labels on the Boisduval specimens in the Smithsonian that contain the wording “a/c Hofer”, were written by Foster Hendrickson Benjamin while he was curator of the William Barnes collection (specifically in 1925 for most or all of the labels). And the symbols “a/c” mean “according to”. And the person Hofer was evidently not Maurice Hofer, but Carl H'fer. Thus the label on the lectotype/neotype of *Phyciodes pulchella*, “Type pulchella Bdv. a/c Hofer.”, means “type pulchella Boisduval according to Oberthür's curator Carl H'fer”, and this label was written by F. H. Benjamin in 1925, based on Benjamin's examination of a list of Boisduval's types written by Carl H'fer. (This list probably still resides in the Smithsonian, and should be found.) The word “Dris.” on one label means “Doctoris”, so the label on the *pulchella* type “EX MUSAEO Dris. BOISDUVAL” means “from museum of Dr. Boisduval”.

The paper on Boisduval types by J. Emmel, T. Emmel, & Mattoon (1998) helps explain the history of the *pulchella* type. To begin with, they claim in their Fig. 2 legend, that Hofer's name was C. H'fer, containing a german-language umlaut. There are two dots forming an apparent umlaut on one label (for *Pontia sisymbrii* in fig. 5). But the actual figured labels usually had only the spelling Hofer, with no umlaut, and a dark spot over the letter o on a very few of the labels was actually a pinhole through the paper of the label (figs. 98, 104, 173), not an unlaut, so his name would seem to be actually Hofer. However there is a dash over some labels (fig. 11, 179), but the dash could just be a part of the start of the top of the letter f as occurs on most labels, or that form of the letter f could be a sloppy way of writing the umlaut. I had thought that J. Emmel, T. Emmel, & Mattoon (1998) assumed that Hofer's first initial was C, evidently because they thought that the “c Hofer” in “a/c Hofer” meant that the lower-case letter c was the first initial of his name. And I had thought that Hofer's first name was actually Maurice, because F. Martin Brown stated that a man named Hofer was the curator of Oberthür's collection (see J. Emmel, T. Emmel, & Mattoon 1998 p. 8), and Oberthür lived in Rennes France, and (as Scott 1998 explained) a Maurice Hofer wrote an obituary (in Petites Nouvelles Entomologiques 1:201-212) of an Frenchman Ernest

Dollfus who lived in Alsace France, in 1872 during Boisduval's time. However, Calhoun (2004) looked into Boisduval's work, and found that Norman D. Riley (1927) wrote that a man Carl H'fer was appointed to organize the sale of Oberthür's collection upon Oberthür's death in 1924. So there were evidently two people with a similar name, and Carl H'fer was the curator, not Maurice Hofer. So evidently the writer of those "a/c Hofer" labels (Foster Hendrickson Benjamin, see below) was sloppy and failed to use two dots for the umlaut on all of the labels except the one in fig. 5.

J. Emmel, T. Emmel, & Mattoon (1998), were mistaken as to the person who wrote the "a/c Hofer" labels on Boisduval specimens. It is obvious that Benjamin wrote all the "a/c Hofer" labels, after viewing all such labels (several dozen) figured by J. Emmel, T. Emmel, & Mattoon (1998), especially the labels shown on their figs. 5, 119, and 164. All three figures have the script initials of FHB, meaning Foster Hendrickson Benjamin. These initials follow or precede the date 1925. According to Mallis (1971), William Barnes had three curators for his collection: James Halliday McDunnough from 1910-1919, Arthur Ward Lindsey from 1919-1921, and Foster Hendrickson Benjamin from 1922-1927. So obviously Benjamin wrote all these labels, many or all in 1925, long after J. Emmel, T. Emmel, & Mattoon (1998) state that James Halliday McDunnough went to Europe to buy these Boisduval types in the year 1913.

Obviously William Barnes did NOT write these labels, as J. Emmel, T. Emmel, & Mattoon (1998) claimed, because Barnes' handwriting (see the label on their fig. 2f) was written in a tremulous hand, nothing like the "a/c Hofer" labels shown on their fig. 2a and on dozens of their other figures. And William Barnes' initials are WB, totally unlike the FHB initials on those labels. J. Emmel, T. Emmel, & Mattoon (1998) were mistaken near the end of their p. 19 in claiming that the label on their fig. 119 read WHB, as the label obviously reads FHB, not WHB, and furthermore there is no evidence that William Barnes' middle initial was H, as his name has always been cited only William Barnes. James Halliday McDunnough's initials are JHM, totally unlike the FHB on the labels, so he did not write them. I concluded in 2002 that Benjamin wrote these labels, and the recent paper by Calhoun (2004) confirms it.

The abbreviation "a/c" in Benjamin's labels was thus written in english, NOT in french, and according to an older Webster's Dictionary, "a/c" means "account current" in the terminology used by accountants, or means just "account", so in the biological context of these labels, the abbreviation "a/c" means "according to". The J. Emmel, T. Emmel, & Mattoon (1998) figures 110 and 113 and 269 also prove that "a/c" mean "according to": the labels in fig. 110 read "type % ariane Bd. a/c [according to] letter to Comstock from Oberthür but not labeled type by Hofer". The labels in fig. 113 read "type & ariane Bd. a/c [according to] Oberthür". The label in fig. 269 reads "type & oetus Bd. a/c [according to] Hofer who notes that while Obth. Label reads % he fig. as &."

The label in J. Emmel, T. Emmel, & Mattoon (1998) fig. 119 (reading "not listed as a type by Hofer but I suspect it is type galactinus Bd. FHB 1925"), seems to suggest that Benjamin had access to a list written by Hofer of Boisduval's type specimens. So maybe there is a list in the Smithsonian of Boisduval's type specimens. Or perhaps the list was just the one in the British Museum of Natural History library mentioned by Calhoun (2004), titled "List of specimens disposed of by C. H'fer prior to the purchase of remainder by the British Museum (Natural History)", stamped "C. H'FER, 36, F8 DE PARIS, RENNES (FRANCE)". That was the address of Oberthür, implying that Carl H'fer was indeed Oberthür's curator.

Calhoun (2004) suggests that Norman D. Riley perhaps prepared that list.

Thus we can now clarify the travels of the Boisduval lectotype/neotype present in the Smithsonian with considerable certainty. It was collected by Pierre Joseph Michel Lorquin in San Francisco and sent to Jean Baptiste Alphonse Dechauffour de Boisduval in France, then purchased by Charles Oberthür of Rennes France, then purchased by James Halliday McDunnough in 1913 for William Barnes of Decatur Illinois, then sold in 1922 with Barnes' collection to the USNM (now called the Smithsonian Institution) in Washington D.C, then labeled "Type pulchella Bd. a/c [according to] Hofer." by Foster Hendrickson Benjamin in 1925, based on a list of Boisduval's types that Carl H'fer had written; the specimen still resides in the Smithsonian. It's actually rather amazing that we can pinpoint the experiences of that specimen so well. Maybe now we can forget about the nomenclature and move on to study the bugs in nature.

## 8A. *PHYCIODES PULCHELLA PULCHELLA (BDV.) 1852*

**DEFINITION.** The cremaster width of a new reared family was larger than the previous rearing, but the cremaster width still seems a little smaller than other taxa.

The mitochondrial DNA of specimens from a coastal marsh in Del Norte Co. Calif. (reared below) were somewhat different from DNA of other *P. pulchella* (Wahlberg, Oliveira, & Scott 2003), so further sampling of DNA in various areas of California might be worthwhile; perhaps all ssp. *pulchella* differ, or perhaps only the marsh population(s) differ, or perhaps there is great variation like in other *Phyciodes*.

**HOSTPLANTS.** Larvae from Del Norte Co. did not eat *Solidago canadensis* leaves placed in their container, so *Solidago* is probably not a hostplant (despite *Solidago californicus* being reported as a hostplant by Garth & Tilden, see Scott 1994).

**EARLY STAGES.** Del Norte Co., Calif. (Palco Marsh, assoc. *Aster chilensis*, egg clusters of 58, 37, and 98 eggs plus 7 loose eggs, sent by Kenneth Hansen). **EGG** light-green, turning brown about a day before hatching as the larva develops

within, ~24 vertical ribs; duration ~9-10 days. **SILK WEB:** almost no web, except a moderate web on a little area where 1<sup>st</sup>-stage larvae molted to 2<sup>nd</sup>-stage. **1<sup>ST</sup>-STAGE LARVA** has little pattern on body. **2<sup>ND</sup>-STAGE LARVA** greenish-tan when young, with some pattern of the usual type (subdorsal band brown, etc.), later the larva brown-tan with the usual pattern of brownish bands & lines. **OLDER-MATURE LARVA** very-dark-brown, with the usual brown lines and bands, the subdorsal cream band mostly complete in all larvae, below BSD an interrupted cream band (especially complete anteroventral to each BSD scolus, this band 30% in a few larvae, 50% complete in most larvae, 60% complete in some, 80% in some), a bit of orange-brown is beside BD1 scolus, a brownish-orange dash is in front of and behind BD2 in subdorsal cream band, a little brownish-orange is posteroventral to BSD, an orangish-brown ring surrounds BL1, BL1 and BSV scoli are orangish-tan (reddish-tan in many larvae, tan in some), the other scoli are blackish-brown (the tips dark, not cream); head entirely black except for a cream vertex dash on each side that is sometimes weak. **PUPA** overall color orangish-tan in 60% of pupae, creamy-tan in 40%, wing-case mottling moderate to fairly strong (weak on a few pupae), cremaster highly shouldered and averaging 0.89 mm width (S.D. 0.13, n=40); duration ~10 days. **DURATION** ~46 days from oviposition to adult emergence in males, ~ 48 females; females emerge an average of 1.8 days later than males in lab.

**SYNONYM (INTERMEDIATES) *INORNATUS*.** Austin (1998b) named *Phyciodes pulchellus inornatus* from Clear Creek, 1500m, Clearwater Can., Sonoma Range, Pershing Co. Nevada. Based on the descriptions and color photos, *inornatus* is closest to *P. pulchella pulchella*, because the antenna nudum is black, and the uns is mostly unspotted like *pulchella*. However it seems to have introgressed with ssp. *camillus* also, because the uns is a little paler tending toward *camillus*, and the upf postmedian pale spots are a little larger and average a bit paler tending toward *camillus*. It may have introgressed with *montana* a little also, as the figures of the ups are a little redder than the “typical” *pulchella*. It occurs in N and central Nevada and extreme NE Calif. and SE Idaho, and Austin shows that it intergrades even more with *camillus* in central and NE Nevada. This *inornatus* does not have any characters of its own compared to its geographic neighbors, as its characters are just stages of intermediacy between *pulchella* and *camillus* and *montana*, so I do not consider it to be a subspecies on its own, because for a subspecies to be valid in my definition, it must have some different character of its own that is not just an intermediate intergrading state. In contrast, *P. pulchella shoshoni* lacks the unh marginal patch, *P. pulchella montana* is much redder, *P. pulchella owimba* has different antenna, etc., characters that are more than just intermediate.

**INTRORESSED POPULATIONS IN SE SIERRA NEVADA.** Scott (1994) reared a population from Inyo Co. Calif. (Coyote Creek, 10000', SW of Bishop), which evidently also has been introgressed to ssp. *camillus*, because the uns is also paler than the orangish *pulchella* and *montana*. These adults are quite small, the ups is quite black like *pulchella* and the unf has little black like *pulchella*, but the ups also tends toward *camillus* as the postmedian spots are a little paler. Overall, this population is near *pulchella* but does seem to tend toward *camillus*, evidently due to past introgression (*P. pulchella* does not occur in southern Nevada now, only eastward in E-C Nevada). Thus this population shows some similarity to the “*inornatus*” just discussed from NW Nevada, though this population is much smaller than that and is dark on ups. Since its characters are intermediate between named ssp., it does not deserve to be named as a ssp. either.

Ken E. Davenport has also collected *P. pulchella* from the east slope of the southern Sierras that show influence from *camillus*. He found specimens similar to the above at Bishop Creek in Inyo Co. At Lubken Can. near Lone Pine, Inyo Co., he found adults that are mostly ssp. *pulchella* but show a little *montana* influence, and also show the influence of *camillus*. Adults from Swall Meadow in Mono Co. also are near *pulchella* but have a definite influence of *camillus*, as the unh is yellower than *pulchella* tending toward *camillus*, and the unf black spots are bigger than *pulchella* (varying from fairly small on some, to large on others almost as spotted as *camillus*).

Evidently sometime in the past some *camillus*—which currently ranges no closer than E-C Nevada--did get into California to influence the *P. pulchella* populations, on the east slope of the Sierra Nevada where *montana* cannot cross readily the very high (Mt. Whitney 14494' etc.) mountains to dilute the influence of *camillus*.

## 8B. *PHYCIODES PULCHELLA DELTARUFA* SCOTT 1998

**RANGE AND STATUS.** Ken Davenport has found that *deltarufa* extends as far south in the San Joaquin Valley as the Kaweah River drainage west of Sequoia Nat. Park. He finds that populations of *P. pulchella* in the western foothills and southern parts of the Sierra Nevada are variable and do not fit the definition of ssp. very well. He has found both black and orange *pulchella* that resemble *deltarufa* in Kern & Tulare Co. north into the Yosemite region. He found orange *montana*-like adults at Fresno Dome Madera Co. where he found black ones in the past. Thus the western foothills of the Sierras do tend to have some orangish adults. These presumably are not ssp. *montana* which has a characteristic uniform pattern of orange, and has the unf discal cell bar orange (versus yellowish in *deltarufa* and other *P. pulchella* ssp.). Evidently *P. pulchella* “*pulchella*” in the Sierras is somewhat different from the Coast Ranges, and it will take a lot more study of the geographic variation of these to sort this all out and determine the exact status of *deltarufa*. Even at the TL, some of the adults of *deltarufa* are solid black, not orangish. If *deltarufa* were intermediate *pulchellaXmontana*, it would be invalid, but that seems doubtful now because the pattern of orange on ups is different and the unf cell bar differs, but time will tell.

**EARLY STAGES.** I have three poor photos of two mature larvae and one pupa from Davis, Yolo Co. Calif., reared by Arthur Shapiro in 1974. **MATURE LARVA** dark-brown, the subdorsal band evidently brownish or dark, the three upper

scoli dark, spiracular band paler tan?, a paler lateral band is ochre near BL1 scoli, BL1 scoli orange-ochre; head black, front not visible in photo. **PUPA** as usual for *Phyciodes* in pattern details, overall color creamy-tan.

### 8C. *PHYCIODES PULCHELLA MONTANA* (BEHR) 1863

**DEFINITION.** The up median band of females can be used to distinguish this species from *P. orseis herlani*, because the band is mostly orangish, but the rear of the band is yellowish in a couple cells. In *herlani*, the band is all orangish, or is occasionally all yellowish-orange, but it is not yellower at the rear.

**SYNONYM (INTERMEDIATES) *VALLIS*.** Austin (1998b) named *Phyciodes pulchellus vallis* from Garden Can., 1820 m, Sweetwater Mts., Lyon Co. Nevada. Based on the description and color photos, *vallis*, which occurs in extreme W Nevada and adjacent Calif. E of the Sierras, is similar to *montana* but a little darker on ups (note that the “female” *montana* specimen fig. by Austin 1998b is actually a male), and seems to be an intergrade between *P. pulchella pulchella* and *P. pulchella montana*. Its uns is reddish and unspotted like both taxa. It is evidently similar to the intergrades found in Plumas/Sierra Cos. Calif. by Arthur Shapiro. The uns is a little paler than *montana*, so there may have been some introgression of *camillus* into this taxon also to make the uns paler. This proposed name *vallis* also lacks any distinctive features of its own, as its character states are just stages in intermediacy between those other ssp., and as such I cannot accept the name, because a subspecies to be valid (in my definition of ssp.; other people have other definitions) must have some different character of its own that is not just an intermediate intergrading condition.

**DISTRIBUTION.** Adults from the western slope of the southern Sierra Nevada are mostly near *montana*. Ken Davenport sent me specimens of near-*montana* from Sherman Pass area (Tulare Co.), N of Roads End (Tulare Co.), Peppermint Creek (Hwy. 190, Tulare Co.), and sent near-*montana* from the Greenhorn Mts. (2 mi. S Tiger Flats, Kern Co.), and Weldon (Kern Co.).

**MISIDENTIFIED PHOTOS.** The “female” *montana* specimen fig. by Austin 1998b is actually a male, as noted above.

### 8D. *PHYCIODES PULCHELLA TUTCHONE* SCOTT 1994

**DEFINITION.** Guppy & Shepard (2001) synonymized *tutchone* and *owimba* to *pratensis*, because “Scott (1994)...was apparently unaware that the species occurs continuously south from southwestern Yukon with no known distinct break that would justify setting up a separate subspecies.” This argument requires that a subspecies must be valid only if there is a distribution break between it and other subspecies, which is ridiculous, and is also hypocritical, because most of the new subspecies that they named in that book have continuous distributions between subspecies. Ssp. *owimba* differs clearly by its antenna color, and less clearly by other wing markings, from ssp. *pulchella=pratensis*.

Few female *tutchone* were in the original series, but Norbert Kondla since sent me photos of females from NW B.C. and Yukon. Ssp. *tutchone* females are smaller than *owimba*, and they have more neatly-arranged rows of spots esp. on upf, as the upf postmedian cream band is a little less prominent than on *owimba* and the submarginal & median upf areas are orangish than *owimba*. Kondla notes that male *tutchone* from those areas are smaller and the dark dorsal marginal banding is narrower than on *owimba*. Kondla suggests that *tutchone* and *owimba* are not synonymous.

### 8E. *PHYCIODES PULCHELLA OWIMBA* SCOTT 1998,

**HOSTPLANT.** Pyle (2002) lists *Aster ledophyllum* as a hostplant, perhaps in Wash. Pyle wrongly gives 3<sup>rd</sup> stage as the overwintering stage in *Phyciodes*; it is actually 4<sup>th</sup> stage.

### 8F. *PHYCIODES PULCHELLA CAMILLUS* EDW. 1871

Under ssp. *pulchella* above, I noted that ssp. *camillus* evidently extended across Nevada at some colder time during the Pleistocene, as the wing pattern of ssp. *pulchella* populations from the southeastern Sierra Nevada (specimens sent by Ken Davenport) now show some influence from *camillus*.

### 8G. *PHYCIODES PULCHELLA SACRAMENTO* J. SCOTT, NEW SUBSPECIES

**DEFINITION:** the same as *P. pulchella camillus* but ups noticeably orangish, as described for “oranger-ups variety” by Scott (1994). **TL and holotype** male (BMNH, fig. in color on plate IV in Scott et al. 2006, and fig. in b/w on fig. 197 in Scott 1994) & 13 male 1 female paratypes (2 males 1 female figs. 198-200 in Scott 1994), all 1 mi. E Cloudcroft, Sacramento Mts., Otero Co. New Mex., April 21, 1972, coll. J. Scott. **Range:** higher Sacramento Mts., S New Mexico.

## C. THE PHAON SPECIES GROUP

**MITOCHONDRIAL DNA & PHYLOGENY.** Wahlberg, Oliveira, & Scott (2003) studied mitochondrial DNA, and found found that one individual of *P. phaon phaon* and two of *P. phaon jalapeno* ended up on the phenogram at the base of the *P. tharos*-group, whereas *P. picta* and *P. pallescens* ended up at the base of both *mylitta/tharos* groups. This suggested based on mtDNA alone that *P. phaon* and *picta/pallescens* do not belong in one species group, as Scott (1994) placed them.

However, most species of *Phyciodes* were found to be quite variable in DNA, and the more specimens that were analyzed, the more variable they were found to be. In fact, Wahlberg's later phenograms have shown (pers. comm.) that the position of *phaon* jumps around a lot, and his Oct. 21, 2004 phenogram of *Phyciodes* places *picta/pallescens* as a sister group of the *P. mylitta* group, and places *phaon* near *picta/pallescens*. (That's one major trouble with computer phenograms in most taxonomic studies by most authors: numerous different trees result, and an addition or deletion of a few taxa or traits very often drastically changes the branching of the tree, causing one to lose confidence in the branching sequence.)

Every other character shows a different placement. There are some major characters shared by *phaon* and *picta/pallescens*, including two characters of male genitalia (much longer gnathos hooks, a shorter aedeagus), two characters of female genitalia (a unique incised V on posterior edge of tegumen, a separate triangular sclerite posterior to the lateral edge of female lamella ostialis), by three characters of paler coloration of older larvae (much paler colors on body, cream [not black] color of adfrontal areas on older larval head, and complete cream ring around larval eyes), by a taller older larval head, and by very weak cones & crests on the pupa. In addition, *phaon* always chooses non-aster hosts, and *picta* often does so. And *P. phaon* and *picta* patrol to seek females, like the *tharos*-group, whereas males of the *P. mylitta* group usually perch to await females.

Thus there are 9-11 good characters placing *phaon* together with *picta/pallescens*. So I will assume that some hybridization or fast evolution occurred eons ago in the early history of this group, such that *phaon* or *picta/pallescens* developed slightly different mitochondrial DNA.

**DEFINITION.** The forewing costa of *phaon* is fairly rounded, like *P. tharos/cocyta/batesii* and *P. vesta*, whereas the other *Phyciodes* have a straighter costa.

### 11A. *PHYCIODES PHAON PHAON* (W. H. EDWARDS) 1864

**DEFINITION.** As stated above, the fw costa is fairly rounded, whereas it averages straighter in *P. picta/pallescens*.

**EARLY STAGES MISIDENTIFIED PHOTO.** The larva photo in Wagner (2005) looks like *P. cocyta* to me, including the ordinary brown ground color and all the color pattern of body and scoli and head etc.; and Comstock & Dammers described the *phaon* head as mostly white, which does not fit this photo at all.

### D. & 12. *PHYCIODES GRAPHICA* (=VESTA) SPECIES-GROUP

**SYNONYMY.** *Phyciodes vesta* is evidently a synonym of *graphica*. According to Geraldo Lamas, William Henry Edwards named *vesta* in Sept.-Oct. 1869, and R. Felder named *graphica* in April 1869, and *graphica* is the same species as *vesta*. Therefore *vesta* is a synonym of *graphica*. I have not studied this situation.

**DNA.** Wahlberg, Oliveira & Scott (2003) compared a long sequence of mitochondrial DNA of *vesta* to other *Phyciodes* species, and concluded that *vesta* is not a member of the *frisia*-group where Scott (1994) placed it, but rather belongs to the base of subgenus *Phyciodes*. Perhaps true. However, *Phyciodes* have tremendous polymorphism in their mtDNA, evidently because the ancestors were variable when speciation occurred, and because hybridization between species transferred mtDNA between species both in ancient times and recently (Wahlberg, Oliveira & Scott 2003). Therefore, perhaps *vesta* got its mtDNA from hybridizing with the ancestor of *Phyciodes mylitta/tharos* where they all fly together in Mexico, and it is still a member of the *frisia* group. Or, probably *vesta* does belong to an evolutionary branch near the base of subgenus *Phyciodes*. However, the genitalic and hostplant traits of *vesta* are similar enough to those of *frisia* that I will still place it between the *frisia*-group and the *mylitta-tharos-phaon* group. Unfortunately, the lesson of mtDNA is that it is highly variable, and highly subject to past and recent hybridization, thus mtDNA can spread through populations independently of nuclear genes, and is thus not very helpful for elucidating the taxonomy of this group. And Machado & Hey (2003) note that mtDNA is not linked to loci associated with genes causing reproductive isolation, so may easily cross species boundaries, making phylogeny reconstruction difficult.

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**Table 1.** Older Larvae of *Phyciodes tharos*-group.

Taxon	Fronto-clypeus Patch (Triangle When Large)	Overall Ground Color	Color Above Vs. Below Subdorsal Cream Band	Subdorsal Cream Band Color	Dorsal Scolus Tip Color	Lateral (BL1) Scolus Base	Color of Ring around BL1 Scolus
<i>riocol-orado</i>	large & cream	brown	dark to paler	strong	pale	ochre-tan or tan	orange
<i>tharos</i> (Minn.)	large & cream, seldom small & brown	brownish-black to brown	dark, some paler	strong, but some 30% nearly absent	pale	light-brown or creamy-tan or orangish-tan	brownish-orange or orangish-brown (some orange)
<i>orantain</i>	mostly large & cream, seldom small & orange-brown	brown (few blackish-brown, few oranger, few creamy-frosted)	paler, few dark (dark in some Neb. families)	strong (seldom moderately interrupted)	pale	ochre-tan, some creamy-tan, some orangish-tan, seldom creamy, rarely light-brown	brownish-orange or orange, some orange-brown
<i>cocyta</i> <i>seleinis</i>	mostly large & cream, seldom 1-3 small brown spots	brown (fewer cream dots on average)	dark, some slightly paler	strong (slightly interrupted on many)	pale	orangish or orangish-tan, some orangish-brown	brownish-orange, some orange, some orange-brown (brown in some Ont. larvae)
<i>incognitus</i>	large & cream	brown	dark	fairly strong	cream	orange-tan	brownish-orange
<i>diminutor</i>	large and cream, seldom dark-brown	brown to blackish brown	dark	strong (slightly interrupted on some)	most pale	orangish-tan, some light-brown	orange-brown, many brownish-orange
<i>batesii</i>	large & cream	brown	dark	strong to moderate	dark	dull orangish-red	reddish-brown to brown
<i>lakota</i>	variable: usually black, rarely large and cream	dark-brown, some brown, many black	dark (rarely slightly paler)	strong to absent	black, some tan	usually slightly-reddish-orange, some orange-tan, rarely orange-red or brown or sl.-orangish-black	orange to brown, a few reddish-orange, rarely orangish-black or brownish-black
<i>apsaa-looke</i>	80% black, some ochre, tan, or cream	blackish-brown, some dark-brown, some black	dark (few paler)	strong, many partial, few absent	dark, few pale	usually orangish-tan, some brown, rarely black	brownish-orange, often orange-brown, rarely orange, brown, or dark-brown
<i>anasazi</i>	often (~33%) black, often small orangish, some cream	blackish to dark-brown, some black, rarely somewhat orangish-brown	dark, few paler	strong, few mod. interrupted (rarely orangish)	blackish to cream	most tan or orangish-tan, rarely brown, creamy, or orange	orange-brown, brownish-orange, seldom orange or brown
<i>camillus</i>	black, very rarely a brown spot	dark-brown, some blackish	dark, some paler	complete to moderately interrupted	dark	orangish-tan, some ochre-tan	brown-orange or brownish-orange
near <i>camillus</i> (Bighorns)	black	dark-brown, some very dark, some moderately orange-brown	dark, few slightly paler	strong to often nearly absent	dark	orangish, orangish-tan, brown, or sl.-reddish-orange-brown	brownish-orange, some orange-brown, rarely brown
<i>pulchella</i>	black	dark-brown	dark, some paler	strong	dark	orange-tan or brownish-orange	brownish-orange or orangish-brown
<i>montana</i>	----	dark-reddish-brown	----	----	dark	----	----

**Table 2.** Larvae and Pupae of *Phyciodes tharos*-group. (\*The 1<sup>st</sup>-stage larva always has a brownish subdorsal band when molting to 2<sup>nd</sup>-stage.)

Taxon	Larva 1 <sup>st</sup> -Stage Pattern*	Larva Silk Web Stages 1-2	Pupa Overall Color	Pupa Dark Wing Streaks	Pupa Cremaster Wings	Pupa Cremaster Roughness
<i>rio-colorado</i>	none	absent or weak	most orange-brown, 20% creamy-orangish-brn.	moderate	95% tapered, 5% winged	weakly to moderately rugose
<i>tharos</i> (Minn.)	none	absent	orange-brown, some brown-orange	weak, with moderate discal cell spot	almost all winged	moderately to strongly rugose
<i>orantain</i>	none	absent, sometimes present	orangish-brown (rarely sl. reddish) or creamier-brn., few creamy, few brown	weak to fairly strong	95% winged, 5% tapered	moderately rugose
<i>cocyta selenis</i>	none or weak, sometimes fairly strong	absent or present	50% quite cream, some light-orange-brown, few dark-brown	strong or moderate, few weak	most winged, ~30-40% tapered	moderately (some very) rugose
<i>incognitus</i>	?	little	most creamy-tan, some brownish, some blackish-gray	often moderate	?	?
<i>diminutor</i>	none or weak	absent or weak	orangish-tan, many cream-tan, some creamy, few brown or gray	moderate, some weak, few strong	most winged, ~20% tapered	moderately rugose
<i>batesii</i>	none (McDunnough)	present	creamy-brn, some orangish-brown	moderate to fairly strong	wide wings	very rugose
<i>lakota</i>	absent or weak	always present	orangish-brn. (a few slightly reddish), often creamy-brown, few creamy, few brown	fairly weak, sometimes strong	wide wings	very rugose
<i>apsaa-looke</i>	absent or weak	always present	creamy-tan or creamy-brown, often grayish or orange-tan or brown, few orange-brown or dark-blackish-brown or blackish	moderate to strong, some weak	wide wings	very rugose
<i>anasazi</i>	absent or weak	always present	orangish-tan, cream-tan, rarely orange-brown, gray, brown, or black	weak to moderate, some strong	wide wings	very (some moderately) rugose
<i>camillus</i>	banded with brown even when young	present	medium-orangish-brown, many brown, some orangish-light-brown or creamy-brown	weak (some moderate)	wide wings	very rugose
near <i>camillus</i> (Bighorn Mts.)	at least dorsolateral band present	little	orangish-brown, few dark-brown, few creamy-orangish-brown	weak (rarely moderate)	wide wings	very rugose
<i>pulchella</i>	weak or absent	weak in three families	light-brown, orangish-tan, or creamy-tan	weak (more or less) to fairly strong	winged, very few tapered	very rugose

**Table 3.** Pupa and Antenna of *Phyciodes tharos*-group.

Taxon	Pupa Cremaster Width	Pupa Transverse Ridges A4-7	Pupa Weak Middorsal Crest A2-4	Pupa Cones	Pupa Subspir. A4 Cone	Antenna Club Nudum Color	Antenna Club Usual Shape
<i>rio-colorado</i>	.83 mm	large	absent	large	moderate	blackish (some && orangish tip)	oval
<i>tharos</i> (Minn.)	0.9, 1.05 mm (two families)	large	seldom present	large	moderate	blackish (some && orangish tip)	oval throughout range
<i>orantain</i>	.87 mm (1.0 lot #M)	large (sometimes rather small)	5-<10% present	large	moderate	orangish (some && blackish)	ellipse
<i>cocyta</i> and <i>selenis</i>	.94 mm (to 1.12 mm)	large/moderate, some rather small	25% present	large	moderate	orange (some && brown)	ellipse, some more elongate
incognitus ?		large/moderate	?	large	moderate	orange	ellipse, some more elongate
<i>diminutor</i>	.99 mm S Minn.	large, many moderate, some rather small	few (~5%)	large	moderate	orange (some && brown)	ellipse, some more elongate
<i>batesii</i>	.95 mm	moderate	~75% present	smaller	smaller	brown-black	ellipse
<i>lakota</i>	1.02 mm (.94 lot W7)	moderate (weak near wing)	~80% present	smaller	smaller	brown-black, very rarely orangish	ellipse
<i>apsaa-looke</i>	1.00 lot F 1.15 lot D	moderate, some larger, rarely large (weak near wing)	~65-70% present	smaller, rarely large	smaller	orange (&& rarely black)	ellipse
<i>anasazi</i>	1.03 mm	small or moderate, few large (weak near wing)	~80% present	smaller, rarely large	smaller	orange (&& seldom brown)	ellipse
<i>camillus</i>	1.01 mm	quite small	~65-70% (Moffat Co. ~5%) present	quite small	quite small	blackish	ellipse
near <i>camillus</i>	1.05 mm	quite small	~65-70% present	quite small	quite small	blackish	ellipse
<i>shoshoni</i>	----	----	----	----	----	blackish	ellipse
<i>pulchella</i>	.78, .89 in two families	quite small	20% to ~33% present	quite small	quite small	dark (some && orange-brown)	ellipse
<i>deltarufa</i>	----	----	----	----	----	dark (some orangish esp. &&)	ellipse
<i>montana</i>	----	quite small	----	quite small	quite small	brown (&& dark-orange/orange-brown)	ellipse
<i>ovimba</i>	----	----	----	----	----	orange	ellipse
<i>tutchone</i>	----	----	----	----	----	orange	ellipse

**Table 4.** Voltinism, Size, and Upperside Wing Pattern of *Phyciodes tharos*-group.

Taxon	Yearly Flights	Forewing Length (mm)	upf median band	upf base color	Dark-Upf &&	uph/upf orange center	Uph Pale Submarg. Line	&& Uph Median Band (% similar)
<i>rio-colorado</i>	3	% 14-16 & 15-17	orange	pale orange	absent	divided && & most %%	moderate	orange
<i>tharos</i>	2-6	% 13-16 & 15-18	orange (some&& paler)	orange	rare	divided && & most %%	moderate	orange
<i>orantain</i>	2-3	% 14-16 & 16-18	orange (some&& paler)	orange	sometimes	divided && & most %%	moderate	orange
<i>cocyta</i> and <i>selenis</i>	1 (2 sometimes Wash.-Ore.)	% 16-18 & 17-20 (Nfld. % 15-16 & 16-18)	usually orange (many or most && paler)	orange	often	very large, undivided (except some &&)	weaker (strong to rarely absent)	orange (wider)
<i>incognitus</i>	2	% 17-19 & 18-21	paler-orange, some orange	orange	seldom?	most large, undivided, often divided	absent to present	orange
<i>diminutor</i>	2, perhaps 3	% 16-18 & 17-20 (3 <sup>rd</sup> -gen. % 15-17 & 16-19)	orange (rarely paler), (most && paler)	orange	some	very large, undivided (except many &&)	weaker (strong to absent)	orange (wider)
<i>batesii</i>	1	% (14) 15-18, & (16) 17-20	paler	dark or oranger	always	usually divided (some % large)	weak, seldom moderate	orange
<i>lakota</i>	1	% (14) 16-18 & (16) 17-19	paler	dark or oranger	usually	usually divided	weak, rarely strong	orange (often slightly paler)
<i>apsaa-looke</i>	1	% 15-18 & 16-20	paler	dark, often oranger	usually	usually divided	weak	orange (usually sl. paler)
<i>anasazi</i>	1	% 16-18 & 18-20	paler usually	very orange	very few	very large, rarely divided except some &&	weak or absent	orange (few slightly paler)
<i>camillus</i>	2 (1 in Bighorn Mts.)	% 15-16 & 16-19	paler	dark, few oranger	most	divided	moderate to strong	orangish-yellow
<i>shoshoni</i>	2	% 14-16 & 16-18	paler	dark, some oranger	most	divided	strong, few moderate	orangish-yellow
<i>pulchella</i>	3-4 (1 N & high Sierras)	% 16-19 & (18)-20	paler	dark	always	divided	absent to moderate	orange-yellow
<i>deltarufa</i>	3	% 15-17 (14) & 17-19	paler	orange, some dark	some	most divided	most strong	orangish-yellow
<i>montana</i>	1	% 16-17 & 17-18	paler or orange	orange	rare	usually divided	strong	orangish, but rear yellowish (% yell-or.)
<i>owimba</i>	1 (2)	% 16-17 & 17-18	paler, few orange	mostly dark	most	divided	absent to moderate	yellow-orange
<i>tutchone</i>	1	% 14-16 & 17	paler (often orange)	rather orangish	most?	divided	weak to moderate	yellowish-orange

**Table 5.** Underside Wing Pattern of *Phyciodes tharos*-group.

Taxon	unf black subapical costal patch	unf submarginal spot cells M1-2	unf black tornus spot (narrower in &)	unf posterior median black spot	unf yellow discal cell bar	unh brown marginal patch	% unh pale marginal crescent (in &&, usually cream) (whiter in form marcia)
<i>rio-colorado</i>	small	russet-brown	large	small or very small	absent	fairly strong, narrower	absent (some weak)
<i>tharos</i>	large	russet-brown & blackish	large	small, few large	absent	strong (darker-brown), narrower	absent (some yellow, seldom cream)
<i>orantain</i>	large	russet-brown, some blackish	large, very rarely giant	small or large	absent	strong (rarely absent), narrower	absent (some yellow, seldom cream)
<i>cocyta</i> and <i>selenis</i>	large	russet brown	large, some moderate	smaller or large	absent	strong, paler-brown	absent (few yellow or cream)
<i>incognitus</i>	large	russet brown	large, some moderate	moderate	absent	strong, paler or darker-brown	absent (some cream)
<i>diminutor</i>	large	russet brown	large, many moderate	smaller, some large	absent	strong, paler brown	absent (few yellow or cream)
<i>batesii</i>	small	orangish, with yellow streaks, rarely a little black	large, few giant	very large, some fairly small in &	absent, sometimes present	absent (some && weak); larger northward to Canada	yellow (56% lost in yellow background), but cream in many &&
<i>lakota</i>	small, seldom large	russet-brown or orange-brown, rarely blackish	large (some larger, seldom giant)	very large, sometimes fairly small	absent, often weak or present	strong (seldom weak)	2/3 present, but usually yellow
<i>apsaa-looke</i>	large	black or blackish	giant	very large, some fairly small	absent, often weak or present	strong	33% brown, 33% yellow, 33% cream
<i>anasazi</i>	large	brown, some black	medium, many giant, few small	very large or medium (some small)	absent, sometimes present	strong (rarely weaker)	33% brown, 33% yellow, 33% cream
<i>camillus</i>	orange or brown (almost no black)	orangish M1, crescent M2	large	large	mostly yellow	strong	yellow (cream in spring)
<i>shoshoni</i>	orangish or tan (almost no black)	orangish or tan or yellow M1, yellowish M2	large	large, some small (small &&)	yellow	absent (some weak)	creamy or yellow
<i>pulchella</i>	orangish (no black)	orangish	narrow dash	small (varies)	most yellow	absent to strong	yellow
<i>deltarufa</i>	orangish (no black)	orangish	narrow dash	small (varies)	yellow	absent, few moderate	yellow
<i>montana</i>	orangish (no black)	orangish	narrow dash	most absent	absent (orange)	absent, few weak	yellow
<i>owimba</i>	orangish (no black)	orangish	narrow dash	moderate (varies)	most yellow	strong, few gone	yellow
<i>tutchone</i>	orangish (no black)	orangish	narrow dash	most small	yellow or absent	strong (some weaker)	usually cream

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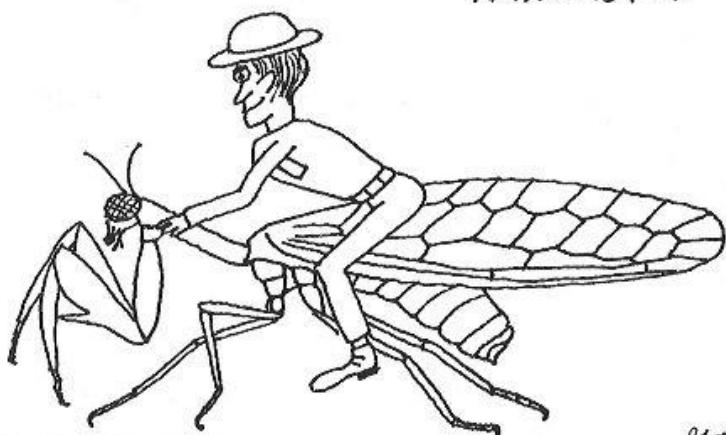
Papilio #7, p. 95: The *Betula* hostplant refers only to Michigan, and *B. frigga* is absent in Utah.

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### PAPILIO BONUS: DR. BOB'S REALLY GOOD COLLECTING TRIP TO THE LAND OF HUMONG



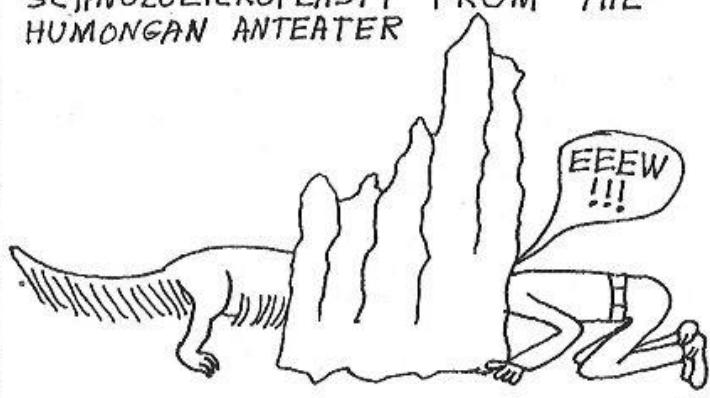
IN THE LAND OF HUMONGOUS INSECTS,  
DR. BOB TAMES THE WILD HUMONGAN  
MANTIS PID



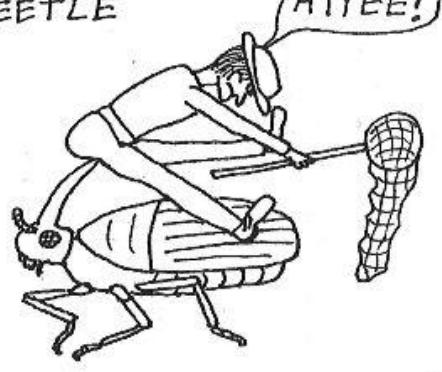
DR. BOB CAPTURES THE  
BOMBARDIER BEETLE



WHILE GATHERING TERMITES IN  
THEIR NEST, DR. BOB GETS A  
SCHNOZOLICKOPLASTY FROM THE  
HUMONGAN ANTEATER



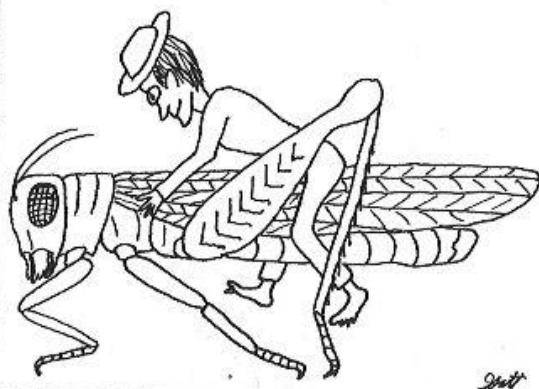
DR. BOB GRABS THE  
WRONG END OF THE  
RHINOCEROS  
BEETLE



DR. BOB STUMBLES  
UPON SIGNS OF THE  
HUMONGAHOPPER



EVEN WITHOUT SHOES, DR. BOB  
MANAGED TO LEAP ONTO THE BUG

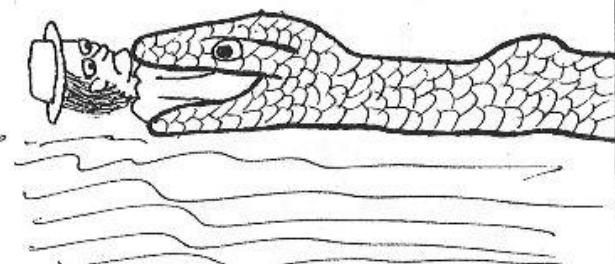


AS THE HOPPER LAUNCHED INTO  
OUTER SPACE, ONLY DR. BOB'S PANTS  
REACHED THE STRATOSPHERE

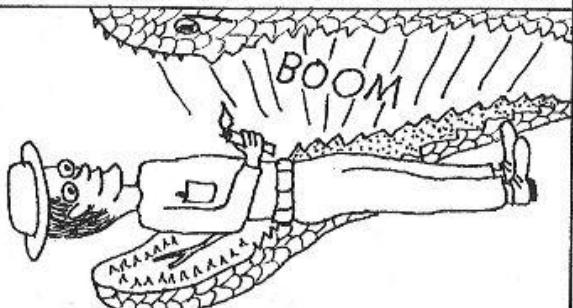




WHEN DR. BOB LEFT THE BEAN DINER, HE WAS WAYLAID BY THE HUMONGOUS HUMONGAN PYTHON

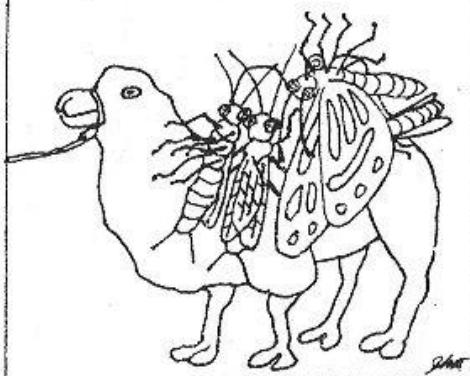


AS THE PYTHON STARTED TO SQUEEZE, DR. BOB COULD FEEL HIS AIR ESCAPING. LUCKILY HE COULD JUST REACH HIS POCKET LIGHTER....

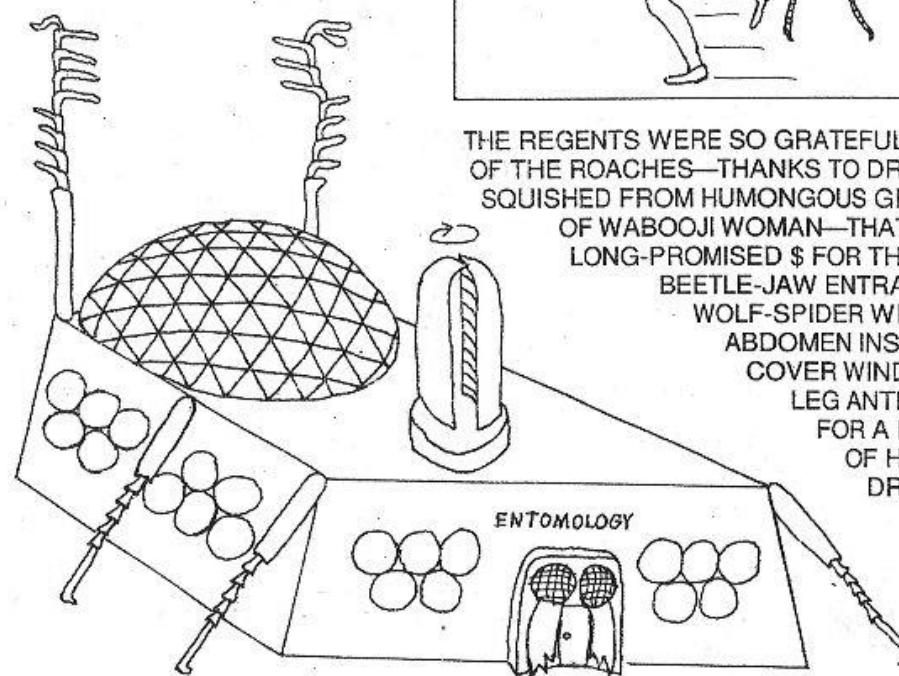


*BOOM*  
THANK GOODNESS FOR NATURAL GAS!

YES, DR. BOB HAD A FEW SMALL DIFFICULTIES ON HIS EXPEDITION. BUT IT WAS A GOOD TRIP, AND ALL THE CAMELS WERE FULLY LOADED WITH HUMONGOUS BUGS.



BACK HOME, THE BUGS WERE MOUNTED, DR. BOB NAMED THE MUDFLY RYALOPETES BORONOOGY, AND THE GIANT PYTHON WAS PRESERVED IN A GIANT PICKLE JAR FROM WAL-MART. BUT BEST OF ALL, THE REGENTS FINALLY AWARDED THE \$ FOR DR. BOB'S NEW INSECT MUSEUM, HELPED ALONG PERHAPS BY A STRAY EGG CASE OF HUMONGAN COCKROACHES THAT SOMEHOW FOUND ITS WAY INTO THE REGENTS BUILDING. THE ROACHES GREW TO HUMONGOUS SIZE AMAZINGLY FAST, CAUSING EMPLOYEES TO RUN SCREAMING FROM THE BUILDING.



THE REGENTS WERE SO GRATEFUL TO DR. BOB FOR GETTING RID OF THE ROACHES—THANKS TO DR. BOB'S WABOOJI JUICE SPRAY SQUISHED FROM HUMONGOUS GRAPES BY THE TALENTED FEET OF WABOOJI WOMAN—THAT THEY AWARDED DR. BOB THE LONG-PROMISED \$ FOR THE MUSEUM. THE MUSEUM HAD BEETLE-JAW ENTRANCE, FLYING-BUTTRESS LEGS, WOLF-SPIDER WINDOWS, AND GEODESIC DOME ABDOMEN INSECTARY. THE VERTICAL WING-COVER WIND GENERATOR AND HDTV HIND-LEG ANTENNAE EARNED ENOUGH CASH FOR A NEW EXPEDITION TO THE LAND OF HUMONG. GLORY BE, THOUGHT DR. BOB, AS HE GAVE THANKS TO WABOOJI WOMAN, WABOOJI JUICE, AND TRULY HUMONGOUS BUGS.